US NAVY COLD WAR GUIDED MISSILE CRUISERS

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NEW VANGUARD 278

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CONTENTS

INTRODUCTION 4

USN MISSILE CRUISER DEVELOPMENT 5

USN MISSILE CRUISER WEAPONS 10

USN MISSILE CRUISERS AT WAR 13

USN MISSILE CRUISERS 18

- Boston Class
- Galveston Class
- Providence Class
- Albany Class
- Leahy Class
- Belknap Class

THE NUCLEAR CRUISERS 32

- *Long Beach*
- *Bainbridge*
- *Truxtun*
- California Class
- Virginia Class

ANALYSIS AND CONCLUSION 44

BIBLIOGRAPHY 47

INDEX 48

US NAVY COLD WAR GUIDED MISSILE CRUISERS

INTRODUCTION

Faced with an increasingly formidable air threat from the Soviet Union in the early days of the Cold War, and with the recent memory of the *kamikaze* threat from World War II, the United States Navy (USN) placed a great priority on developing air defense missiles and getting them to sea to protect the fleet. The first air defense missiles, the long-range Talos and the medium-range Terrier, were large weapons and needed a large ship to carry them and their sensors. The quickest solution was to take some of the many cruisers built during World War II and convert them into missile cruisers. The result was a mix of five converted heavy and six converted light cruisers, which entered service in 1955 and served until 1980. These were the largest non-carrier combatants in the USN during most of this period. Aside from providing long-range fleet air defense, these ships were often used as fleet flagships. They served in the front lines of the Cold War and most saw combat service in Vietnam. To screen the USN's carrier battle groups, several other classes of missile combatants were developed. These included two large classes of so-

Gridley seen underway *c.* 1975. The ship was active all over the globe in what was a typical career for a Leahy-class cruiser during the Cold War. *Gridley* made six Vietnam deployments, responded to a crisis off Korea in 1971, covered the evacuation of Vietnam and took part in the recapture of the American merchant ship *Mayaguez* in 1975, operated in the Indian Ocean 1980–81, responded to the Libyan crisis in 1987, and took part in the First Gulf War. (Naval History and Heritage Command)

called guided missile frigates, which were later reclassified as guided missile cruisers. Complementing the 29 conventionally powered missile cruisers was a much smaller number of nuclear-powered cruisers. These were so expensive that only nine were built, including *Long Beach*, the USN's first and only ship designed and built as a guided missile cruiser. Until replaced by the Ticonderoga and Burke classes of Aegis ships, the USN's 38 missile cruisers were the most capable and important surface combatants in the fleet and served all over the globe during the Cold War.

USN MISSILE CRUISER DEVELOPMENT

At the end of World War II, the aircraft carrier emerged as pre-eminent in the USN. The speed and firepower of American cruisers allowed them to play a major role during the war, but with the carrier firmly established as the offensive core of the fleet, the USN's cruisers were given a clear focus of protecting the carriers. Since few navies had a significant ocean-going surface fleet that could threaten American carriers, the primary duty of the USN's cruisers became the protection of the carrier against air attack.

Since guns no longer had the range to defend against bombers with stand-off missiles, and because greater accuracy was needed against high-speed threats, the USN's attention turned to the development of a whole new family of air defense missiles. Large guns became an afterthought on guided missile cruisers, to the point that some USN missile cruisers were designed without any guns at all. This proved too revolutionary and guns were eventually fitted on all missile cruisers; the converted missile cruisers retained some of their large guns that proved useful in Korea and Vietnam in shore bombardment roles. After it was obvious that some guns were required for self-defense, the USN's new-build missile cruisers were equipped with dual-purpose 5-inch guns for protection against air and surface attack and to allow them to perform in a gunfire support role.

The USN needed large ships to carry the new family of air defense missiles and all their associated electronics. Carriers had the large volume needed to carry these air defense missile systems, but the USN preferred to devote the available space on these ships to carrying a large air group. Battleships were potential platforms, but these were being retired from the active fleet. Since destroyers were too small to carry the first-generation medium and long-range missile systems, this left the cruiser as the best platform for missile defense ships. The USN had many light and heavy cruisers built during the war that were no longer needed as gun platforms, so the decision

The USN practiced multi-layered missile defenses during major fleet exercises like that shown here in June 1975. *Chicago* in the foreground was equipped with the long-range Talos missile system and *Sterett* carried the medium-range Terrier system. In the background is *Fort Fisher* (LSD-40). (Naval History and Heritage Command)

Galveston steaming on August 24, 1964. The forward part of the ship has been little changed from her original light cruiser configuration. On the forward lattice mast is an SPS-37A long-range air search radar, the amidships lattice mast hosts an SPS-42, and an SPS-30 height-finder is on the aft radar platform. (Naval History and Heritage Command)

was made to convert many of these fairly new ships into missile cruisers.

The first step was made in July 1948 when a heavy cruiser conversion was included in the tentative Fiscal Year (FY) 50 shipbuilding and conversion program. In the postwar environment, USN shipbuilding and conversion funds were limited, so the conversion slipped to FY 51 and again to FY 52 because of the continuing lack of funds.

Heavy cruiser *Wichita* was rejected as a candidate for conversion because of her age (she was commissioned in 1939). The uncompleted Alaska-class large cruiser *Hawaii* was also considered for conversion. Despite the fact *Hawaii* had the volume to carry a large number of missiles, it was decided to convert her into a command cruiser instead (this was never carried out though). This left the Baltimore-class heavy cruisers. *Boston* and *Canberra* were selected and placed on the FY 52 shipbuilding and conversion plan.

The USN was searching for conversions to carry the new long-range Talos missile system. The Baltimore class was favored for several reasons. Only two of this class were out of service in 1954 and more than two were needed for the Talos program. Taking more out of service was not an option, since the Baltimores with their 8-inch batteries were valuable as gun cruisers. There remained 26 Cleveland-class light cruisers in reserve. The FY 56 plan included the conversion of one Cleveland-class ship into a guided-missile cruiser. The ship selected was *Galveston*, which was never fully completed or commissioned. In the FY 56 and 57 programs, a total of six Cleveland-class ships were slated for conversion. There were problems using the Cleveland-class ships, since they had been overloaded during the war and had stability issues. The size of the new missile magazines and their armor only increased the topweight problems.

The three Talos conversions (Project SCB 140) and the three Terrier missile conversions (SCB 146) were very expensive. Except for the missiles and their associated guidance and search radars, and the shape of the magazines,

USN CRUISER DESIGNATIONS

As a result of the London Naval Treaty of 1930, the USN designated its cruisers as either heavy (with the designation CA) or light (CL). The light cruiser designation included all 5- and 6-inch gunned ships and the heavy cruisers were 8-inch gunned ships. In 1949, the 5-inch gunned cruisers were redesignated as light antiaircraft cruisers (CLAA). When missile cruisers were introduced, the ships were initially given the designation CAG or CLG to indicate that they were conversions from heavy and light cruisers. Cruiser conversions that did not retain their original heavy guns (the Albany class) and new-build guided-missile cruisers were simply designated CGs. The "G" stood for guided missile. To receive this designation, the missile had to be over a certain range; a point-defense missile was not enough to give it a guided missile designation. The new guided-missile cruisers were numbered in sequence, but there were gaps (13–15 and 42–46). In 1975, the designation system for missile combatants was made much simpler when all existing guided-missile frigates (DLG) (with the exception of the Coontz class) were reclassified missile cruisers (CG). This reclassification was done to more accurately describe the capabilities of the ships concerned (principally the Leahy and Belknap classes), but it also gave the USN an instant increase in the numbers of cruisers at a time when the growth of the Soviet Navy cruiser force seemed overwhelming. The final type of missile cruisers was those with nuclear power. These were given the designation CGN, the "N" indicating nuclear power. Today, the USN only operates CGs.

the conversions were much alike. The forward 6-inch gun turrets and the forward superstructure with its three twin 5-inch/38 gun mounts were left in place. The SCB 146 conversions were as austere as possible. Magazine space was 32 ready-fire missiles and 48 in magazine stowage. The next two Talos conversions were authorized in FY 57.

Eventually, four of the six Cleveland-class conversions were fitted as fleet flagships. The space requirements were extensive, so in exchange for large command spaces, one of the triple 6-inch/47 turrets and two twin 5-inch/38 gun mounts were removed. These ships converted into flagships were Talos conversions *Little Rock* and *Oklahoma City* and Terrier conversions *Providence* and *Springfield*.

Oklahoma City is moved alongside *Providence* at Yokosuka Naval Station, Japan, July 7, 1964. *Oklahoma City* was the first Talos ship in the Pacific Fleet and spent most of her career as Seventh Fleet flagship. From December 1974, she was homeported in Yokosuka. She served as flagship until October 1979 and was decommissioned later that year. (Naval History and Heritage Command)

The FY 58 plan included no additional light cruiser conversions. In October 1956 the USN decided against any further Terrier conversions. Additional Talos conversions were desired, but for these heavy cruiser hulls were required. By this time, the all-gun cruisers were not considered as valuable, which meant that active cruisers were available for possible conversion. The newest heavy cruisers, the three ships of the Des Moines class, were considered off limits because of their advanced 8-inch guns and because of their radar and communications improvements. Four of the Baltimore class had been converted to carry the long-range Regulus nuclear land-attack missiles, but these were also too valuable to take out of service. The USN wanted these conversions to be "double-enders," that is have missile launchers forward and aft. This gave the ships a much greater missile capacity. The SCB 173 design that was adopted was an all-missile ship with Talos, the short-range Tartar missile system for self-defense, and an Antisubmarine Rocket (ASROC) launcher for antisubmarine warfare (ASW). The three ships converted became the Albany class. The project cost $170 million per ship, extremely expensive for the time.

Guided missile cruiser conversions ended with the FY 59 plan. As enthusiasm for conversions waned, interest in nuclear-powered surface combatants increased. Informal design work on a large nuclear-powered missile cruiser began in 1954, but the development of a suitable nuclear power plant determined the progress of the concept. Putting a nuclear reactor on a surface combatant was attractive, since it solved the primary problem of these ships – a lack of endurance. On the other side of the equation was the greatly increased costs of nuclear-powered ships. The USN wanted such a ship to be large enough to mount the long-range Talos, which further increased costs.

Chicago underway in San Francisco Bay on August 5, 1964 just months after being recommissioned as a missile cruiser. The scope of the conversion from a heavy cruiser is evident, since only the hull remains from the original ship. (Naval History and Heritage Command)

Admiral Arleigh Burke, then Chief of Naval Operations (CNO), was convinced to go ahead with nuclear-powered surface combatants

THE MISSILE FRIGATES

Concurrently with the cruiser conversions, the USN looked for a way to get a missile system to sea on a large destroyer-sized ship. The need for antiaircraft protection to carrier task groups was paramount in the 1950s, and to increase the numbers of escorts available the USN began to build a series of specialized escorts with antiaircraft missiles. As early as 1954, the USN took to calling these escorts missile frigates, which was a totally inappropriate and confusing use of the archaic term of frigate. During World War II several navies used the classification frigate to describe small ASW ships. Using this term meant that the USN would end up building frigates larger than Soviet cruisers, an obviously misleading state of affairs. It was quickly determined that Talos would not fit on a frigate, but Terrier could. The real problem was that the size of even the smallest radar and its power requirements pushed the missile frigate into the area of 8,000–10,000 tons full load displacement, which made it as large as a cruiser. Since both the missile frigate and the missile cruiser carried long-range weapons and were almost comparable in size, the primary distinction between them became their command and control facilities. Cruisers were fitted with major command facilities and frigates were not. In 1975, the USN reclassified its frigates as cruisers (see the text box on page 6 for a full explanation).

Missile frigates were designed as more than just missile platforms. They had to be faster than the carriers they were escorting, and since there was a significant Soviet submarine threat, these ships were given ASW detection and engagement capabilities. The ships' principal weapons were their antiaircraft missiles. Early in the design process, Terrier was identified as the most suitable missile system. This required a large electronics suite including a 3-D radar, an air-search radar, and two or more guidance radars for the missiles. The first attempt to put all these capabilities into a single hull was the 10-ship Coontz class, which was authorized in 1956 and laid down in 1957.

The first missile frigate class destined to become a missile cruiser was the 9-ship Leahy class. The ships of this class were large and were comparable in size to World War II light cruisers. They were authorized in 1958–59 and construction on the lead ship of the class, *Leahy*, was begun in December 1959. When completed they were clearly a departure from previous designs. Their futuristic appearance was created by the deletion of stacks in favor of two macks (combined masts and stacks) and a mostly-missile armament. With a Terrier system forward and aft, these ships were known as "double-enders." An ASROC launcher forward and the powerful SQS-23 bow sonar gave the class a long-range ASW capability. The only guns fitted were two twin 3-inch/50 mounts.

The next class was originally envisioned as a repeat of the Leahy class. However, once the desired improvements were incorporated, it was an entirely new class. The new SQS-26 bow sonar was added. By this time, the Mk-10 launcher used to fire the Terrier was adapted to fire ASROC. This meant that considerable weight and space was saved by deleting the

Leahy, commissioned in 1962, was an extremely modern ship for her time. The Leahy class introduced the mack, which dominated the profile of the ship. The ship was fitted with two Mk 10 missile launchers forward and aft and only two 3-inch/50 twin mounts. (Naval History and Heritage Command)

The two California-class missile frigates (later cruisers) were ordered to escort the new Nimitz-class nuclear-powered carriers. This view shows one of the few times the two missile cruisers operated with Nimitz. (Author's collection)

requirement to carry a dedicated ASROC launcher with its own magazine. Abaft the helicopter deck, a single 5-inch/54 mount was fitted, which replaced the aft Terrier system. This was the first class to incorporate the Naval Tactical Data System (NTDS) and the first frigate to have a helicopter deck and a dedicated hangar. The class was named after the lead ship, *Belknap*, laid down in February 1962. The final ship was not commissioned until January 1967. At the direction of Congress, a tenth ship was built as a nuclear-powered version and named *Truxton*.

The Belknap class was another example of the increasing cost and complexity of the USN's missile ships. These rising costs, for which there was no hope of curtailing, severely handicapped the Navy's modernization program. The pace of construction slowed as problems with the Tartar-Talos-Terrier (3-T) series continued. Secretary of Defense McNamara opposed any more missile frigates or cruisers for FY 63 and 64 due to the expense. Things got worse – no money was spent on any missile destroyers, frigates, or cruisers in FY 65 and 66.

What became the next generation of missile ships was first outlined by the CNO in 1963. It was initially proposed as a conventionally powered guided-missile destroyer, but by July 1966 the ship had grown to 525 feet in length with a standard displacement of 8,450 tons. What became known as the DDG FY 67 was not approved by Congress unaltered. During this period, Congress requested that any warship over 7,000 tons should have nuclear propulsion. It was also preferred to produce nuclear-powered missile combatants to escort the Nimitz class of nuclear-powered aircraft carriers. This prompted the authorization of one nuclear-powered missile frigate in FY 67 and another the following year. These became the California class.

The USN had been advocating for a large standardized class of missile ships called the DXG. This became the DXGN when nuclear power briefly became ascendant. The class would carry the Advanced Surface Missile System (ASMS), which was conceived in 1963 when it became clear that the Typhon program was near death due to excessive costs. The ASMS eventually became the Aegis system. Development of ASMS fell behind, so with the requirement for nuclear-powered missile escorts for the Nimitz class growing, the next four guided missile frigates were built as nuclear missile frigates without Aegis. The Navy wanted eight nuclear-powered strike cruisers and 16 conventionally powered Aegis ships in the FY 77 and FY 78 programs, respectively. The lead Aegis ship, DDG 47, was approved for FY 78, but the strike cruisers were never built. The lead DDG 47 was laid down in January 1980. By this time, it had grown to almost 10,000 tons and was re-typed as a missile cruiser. The revolutionary Aegis cruiser and the Aegis destroyer are the subjects of future Osprey books.

This is a fine view of *Virginia* lead ship of the last class of USN nuclear-powered surface combatants. Visible is the forward Mk 26 launcher, the Mk 45 5-inch/54 gun and the Harpoon canisters forward of the bridge. The large radar on the forward mast is the SPS-48C 3-D air search radar. (Naval History and Heritage Command)

on a prototype basis. Burke wanted new ships to be able to operate independently in a nuclear war scenario, which required that a ship should possess significant ASW and antiair (AAW) capabilities. He also wanted it to have a surface strike capability in the form of the Regulus missile, but later relented on this requirement because of the cost. In the end, the project was mainly about getting the new technology of nuclear power to sea and the first ship was placed on the FY 57 program. The result was the unique *Long Beach*.

By 1957 shipbuilding funds were again in short supply. Cost was the deciding factor in the decision not to build several conventional and nuclear cruisers equipped with the second-generation Typhon missile system. Any thoughts of building an 11,400-ton missile frigate fitted with Typhon were also abandoned. Though potentially much more effective, the Typhon-equipped ships were much more expensive, and the technology remained unproven. In September 1961, the Secretary of Defense killed the USN's remaining cruiser programs.

In the 1970s, there was a brief resurgence in the missile cruiser in the form of the strike cruiser concept. This was a large ship fitted with nuclear power, the new Aegis air defense system, significant command facilities, and the highest degree of armored protection of any ship built since World War II. It was designed for independent operations and would have been an extremely capable and expensive ship. It almost came to life in the FY 78 program in the form of eight ships, but the program's high costs forced its cancelation.

USN MISSILE CRUISER WEAPONS

The most important weapon of a guided-missile cruiser is its extended-range surface-to-air missile (SAM). The cruisers in this book carried the first generation of American naval SAMs. These were the 3-T family – Tartar/Terrier/Talos. The Tartar system was designed for use aboard destroyers; only the Albany-class cruisers carried Tartar. The Terrier was a medium-range system, and the Talos was designed for long-range protection of the fleet. There were massive teething problems with this technology. There was an ongoing issue with reliability, which was addressed over time. The bigger problem was the technology itself. The first-generation systems required a dedicated fire-control channel for each engagement. This occupied the channel for the entire engagement, that is from launch until the missile hit the target. This was a crippling limitation, since missile cruisers usually carried only one or two sets of guidance radars, which meant that only one or two targets could be engaged at a time. Against the Soviet threat of

regimental-sized raids by long-range bombers, this meant that the air defense of a task force could be easily saturated. The solution to the saturation problem was to develop a command system that could handle many engagements simultaneously. This was the basis for the second-generation Typhon system which was not funded and the third-generation Aegis system which was first deployed on the Ticonderoga-class cruisers.

As the USN pondered its first missile cruiser conversion, there were two missile programs in progress – the ramjet-powered, long-range Talos and the shorter-range Terrier. Of these, the Terrier was much simpler, so it was ordered for the first conversion. In order to field some sort of antiair missile capability, the program was given the highest priority.

Dale launching a Terrier missile while steaming off Point Mugu, California in April 1964. Note that all four SPG-55 missile guidance radars are tracking the target. In 1964, Terrier was still a troubled system. (Naval History and Heritage Command)

Terrier was the first SAM deployed on a USN ship. The first variants used beam-riding guidance, but the last versions introduced semi-active radar homing. Performance was disappointing, with the missile only able to engage subsonic targets at a range up to 10nm. The USN persisted in efforts to improve the missile and later variants had an increased range of up to 40nm with speeds up to Mach 3 and with some ability to engage low-flying targets.

The next missile fielded was Talos. The Mark (Mk) 7 launcher on the three light cruiser conversions had 16 ready-use missiles and another 30 unassembled missiles. *Long Beach* and three Albany class used the Mk 12 launcher with a 52-missile magazine. Talos was a very large weapon at 32 feet long. It was a beam-riding missile until it got close to the target, after which it used semiactive radar homing for terminal guidance. It was also fielded in nuclear and antiradiation (ARM) variants. Maintenance problems with the SPG-49 tracking and illumination radar were a major factor in the decision to decommission the Talos in 1979. Another factor in the retirement of the Talos system was that the old cruisers that carried them were all being retired.

The Standard family of missiles replaced the 3-T series. The RIM-66 missile was the replacement for the Terrier and Tartar. The RIM-67 is an extended-range version that uses a solid rocket booster and was introduced in 1981. The SM-1 was operational in 1968 and the SM-2 followed in 1976, first being deployed on *Wainwright*. The missile has an antisurface capability

This view of *Little Rock* entering Genoa, Italy on July 10, 1961 shows her Talos battery and associated radar equipment. On the Mk 7 Mod 0 launcher are two Talos missiles. Forward of the launcher was SPG-49A missile guidance radars. The small radar forward and aft of the SPG-49As are the SPW-2 fire control set, which generated the beam along which the Talos was guided. The Talos ships always had their 3-D air search radar amidships (like the SPS-39 shown here), which was the highest location on the ship. This was an identifying feature from the Terrier ships, which had their 3-D radar on the forward mast. (M. Brescia collection)

using semi-active homing at line-of-sight or over the horizon using inertial guidance and infrared homing. Standard remains in service today and is less susceptible to electric countermeasures (ECM), has faster reaction times, and an overall better kill probability.

USN Cruiser Surface-to-air Missiles

Missile	Purpose	Range	Fitted on
RIM-8 Talos	Long-range SAM	RIM-8A 50nm RIM-8C 100nm RIM-8J 130nm	*Galveston*, *Little Rock*, *Oklahoma City*, *Long Beach*, *Albany*, *Columbus*, *Chicago*
RIM-2 Terrier	Medium-range SAM	RIM-2A 10nm RIM-2D 20nm RIM-2F 40nm	Boston class; *Providence*, *Springfield*, *Topeka*; Leahy and Belknap classes; *Bainbridge*, *Truxtun*
RIM-66 Standard (SM-1MR/SM-2MR)	Medium-range SAM	40–90nm	California and Virginia classes; all upgraded ships
RIM-67 Standard SM-1ER/SM-2ER	Long-range SAM	65–100nm	*Long Beach*, Leahy and Belknap classes; *Bainbridge*, *Truxtun*

Beginning in 1977, USN surface combatants were equipped with the RGM-84 Harpoon antiship missile. This was an important development, since it gave American warships offensive striking power for the first time in the Cold War. Harpoon was a sea-skimming subsonic (Mach .7) missile with a warhead of 488 pounds. The range of the missile was in excess of 67nm. Updated versions of the missile remain in service today.

Another development which provided USN missile cruisers with a new capability was the deployment of the BGM-109 Tomahawk Land Attack Missile. These long-range, subsonic cruise missiles were first used in combat during the 1991 Gulf War. Several variants were fielded, including nuclear, antiship, conventional, and cluster munitions. The most common version is the land-attack version BGM-109C with a unitary warhead. The Block III version introduced in 1993 has a range of 900nm. On USN missile cruisers, Tomahawks were stored and launched from Armored Box Launchers (ABL) fitted on *Long Beach* and the four Virginia-class cruisers.

All USN missile cruisers still carried guns. Only the converted World War II cruisers carried the 8-inch and 6-inch guns in triple-gun turrets. Both were proven and powerful weapons used extensively in Vietnam for shore bombardment. The converted cruisers carried the stalwart 5-inch/38 gun. Very reliable and accurate, it was obsolescent by the 1950s. Its replacement was the 5-inch/54 Mark 42 mount. This mount carried a single gun and first entered service in 1953. It was a very capable, dual-purpose, automatic system, but it weighed over 61 tons and suffered from reliability problems. The 5-inch/54 Mark 45 mount was a lightweight (22.5 tons) 5-inch gun which entered service in 1971. It was easier to maintain and exhibited improved reliability. It remains in service.

Galveston launches a Talos guided missile on February 24, 1959, the first time Talos was fired at sea. The missile was several years behind in development at this point, but eventually proved more reliable than the Terrier missile. (Naval History and Heritage Command)

USN Missile Cruiser Guns				
System	**Shell size**	**Rate of fire**	**Maximum Range**	**Fitted on**
8-inch/55	260 pounds (HE)	3–4 rounds per minute	30,050 yards	Boston class
6-inch/47	130 pounds	8–12 rounds per minute	26,118 yards	Galveston and Providence classes
5-inch/38	54 pounds	15–20 rounds per minute	18,200 yards	Boston, Galveston, Providence, Albany classes, *Long Beach*
5-inch/54 Mark 42	70 pounds	40 rounds per minute (changed to 28 in 1968)	25,909 yards	Belknap class, *Truxtun*
5-inch/54 Mark 45	70 pounds	16–20 rounds per minute	26,000 yards	California and Virginia classes
3-inch/50	24 pounds	45–50 rounds per minute	14,600 yards	Boston, Leahy, and Belknap classes
Mk-15 Phalanx CIWS	20mm shell	4,500 rounds per minute	Approx. 4,000 yards	All ships in service after 1980

A significant improvement in the antiship missile defense of USN missile cruisers was the deployment of the Phalanx Close-in Weapons System (CIWS). The last-ditch defensive system designed to defeat antiship missiles started to enter the fleet in 1980. It uses a 20mm 6-barrel Gatling gun with a theoretical rate of fire of 4,500 rounds per minute. Phalanx is a self-contained system with its own radar and can act in an autonomous mode.

USN MISSILE CRUISERS AT WAR

As they were commissioned, early USN missile cruisers assumed their roles as air defense escorts for carrier task groups. The goal was to have one missile cruiser and three missile frigates per deployable attack carrier, though the USN never achieved that. The larger missile cruiser conversions, most capable of acting as flagships, acted as such for the numbered fleets. The primary war-fighting fleets of the period were the Sixth Fleet assigned to the Mediterranean, the Seventh Fleet assigned to the Western Pacific, and the Second Fleet assigned to direct USN and NATO operations in the North Atlantic. These were the foci of missile cruiser deployments, since the USN maintained two carriers each in the Mediterranean and Western Pacific. Carriers and their cruiser escorts were also active in the North Atlantic and after 1968 in the Indian Ocean.

The threat from the growing Soviet Navy could not be ignored. The Soviets built large numbers of Komar and Osa missile boats in the early 1960s that carried the SS-N-2 Styx antiship missile. The Soviets also built their own missile cruisers beginning with four ships of the Kynda class; these embarked the SS-N-3 Shaddock missile with a range of 250nm. These were followed by the Kresta I class, which also carried the Shaddock, which was specifically designed to kill USN carriers. American naval officers believed that Soviet surface threats could be handled by carrier aviation. More challenging to USN carriers was the appearance of the conventionally powered Juliett and nuclear-powered Echo II-class submarines carrying between four and eight Shaddocks. The Soviets also deployed long-range antiship missiles on Badger bombers with the AS-2 Kipper missile having a range of over 100nm. These developments stressed the defenses of USN carrier task forces and demanded that the USN fix the problems with its naval SAMs. By the start of

These are two Terrier missiles on a Mk 10 launcher aboard Belknap-class *William H. Standley* in 1972. The Terrier missile system was the most deployed air defense missile in the fleet and its success was essential. By 1972, the Terrier had become a reliable weapon with a range up to 40nm. (Naval History and Heritage Command)

1964, there were 56 ships with guided missiles in the fleet – 12 cruisers, 21 frigates, and 23 destroyers. This significant investment was still unable to provide a high degree of protection to the fleet against air threats.

Both the Styx and Shaddock were large targets that flew at subsonic speeds, and the USN was confident their missiles could deal with them when they were flying at altitude. But the 3-T missiles proved to be erratic. In one 1964 exercise conducted by Pacific Fleet units, 178 raiders evaded carrier fighters and attacked the fleet. Of these, only 12 were downed by missiles. In the same time period, an Atlantic Fleet missile frigate reported a seven percent success rate for its Terriers. These problems were indicative of the general ineffectiveness of the 3-T programs, which prompted the 3-T "Get Well" program run by a former skipper of *Canberra* directly reporting to the Secretary of the Navy. The Get Well team identified three major problem areas. The entire effort ultimately led to the Standard missile, but before that could happen the 3-Ts had to be fixed. By 1966, over half of the Terriers and Tartars fired hit their targets and Talos scored a hit rate of 35 percent. Improvements in fuel technology also led to longer engagement ranges. During this period, the USN made significant progress in ironing out issues with the NTDS, which allowed all ships in a task force to see what every other ship was seeing. This dramatically reduced the incidences of engaging friendly aircraft, which had been a recurring problem during exercises. The Leahy-class first got their NTDS systems in 1967, but it took a while until every ship in the fleet was equipped with the new system.

The urgency of the antiship threat was dramatically demonstrated in October 1967 when three Styx missiles sank the Israeli destroyer *Eilat*. This proved a shock to the USN – suddenly countering the Soviet antiship missile threat became a top priority. Continuing progress was made on the 3-T missiles and reliability improved to the point where 180 consecutive Talos flights were conducted without a single failure. Against drones simulating manned aircraft, the 3-T missiles performed much better. Against modern Soviet antiship missiles, which were much faster, accompanied by jamming, or were sea-skimming, there was much less confidence that the 3-Ts could be effective. Production of Terrier and Tartar stopped in 1966 and the last

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OPERATION *PRAYING MANTIS*

On April 18, 1988, several USN surface action groups (SAG) conducted an operation against Iranian facilities and naval units in the Persian Gulf. SAG Charlie included missile cruiser *Wainwright*. After destroying an Iranian oil platform, the SAG was challenged by an Iranian Kaman-class guided missile patrol craft (PTG), which launched a Harpoon missile at the cruiser. The missile passed closely down *Wainwright*'s starboard side but did not hit. In response, *Wainwright* and destroyer *Simpson* fired four SM-1 missiles at the Iranian craft – all four hit. An additional SM-1 was later fired that also hit and a Harpoon was fired, but did not hit, probably because of the effect of the volley of SM-1s, which reduced the profile of the target. The American ships closed with the PTG and sank it with gunfire. At about the same time, *Wainwright* fired two SM-2 missiles at an incoming Iranian F-4 aircraft. The aircraft was hit, but it was apparently able to return to base.

28

Talos was built in 1970. In its place came the Standard missile, which had two versions. The medium-range version used the Tartar propulsion system and the long-range version used the Terrier propulsion system. The new missile had solid-state electronics and improved inertial navigation. Most importantly, it was much more effective against surface targets and sea-skimming missiles.

If the 3-T missile missed the incoming antiship missile, the USN counted on terminal defense measures. The first of these was ECM. Cruisers were equipped with jammers that transmitted deceptive or high-powered signals on the frequency band of the incoming threat missiles. Another measure was to use chaff to create false targets to decoy the missile away from its target. Complementing these "soft-kill" measures were "hard-kill" ones used to shoot down the antiship missile with missiles or guns. It was recognized that the standard 3-inch or 5-inch guns on cruisers had little chance of shooting down a modern antiship missile, so the USN began the development of a high-velocity, rapid-fire terminal defense system, which ultimately became known as the Phalanx and reached the fleet in 1980. The short-range Sea Sparrow missile system was also developed to deal with the antiship missile threat, but it was not deployed on cruisers.

The growth of the Soviet Navy continued unabated and was highlighted by a pair of global exercises in 1970 and 1975. The CNO during most of this period, Admiral Elmo Zumwalt, was pessimistic about the USN's chances against the Soviet Navy in any kind of conflict. Perhaps the closest the two navies came to actual conflict was during the October 1973 Yom Kippur War. Over 60 USN warships including three carriers faced off against 96 Soviet ships in the confined waters of the Mediterranean. Hostilities between the superpowers never broke out, but the outcome of any naval war was far from certain, mainly because of the USN's inability to counter Soviet antiship missiles. The pessimistic Zumwalt instituted a number of reforms with a particular focus on reinvigorating the surface fleet.

As the USN tried to grow the size of its missile combatant force, a debate raged over the future of nuclear propulsion in these ships. In 1964, the USN's first three nuclear ships conducted a demonstration of their capabilities with a circumnavigation of the globe without refueling or replenishing. *Long Beach* and *Bainbridge* escorted the carrier *Enterprise* out of Gibraltar on July 31 and for the next 58 days averaged 25 knots. Operation *Sea Orbit* was judged a complete success and it seemed to confirm the ascendancy of nuclear power for large combatants. In the end, however, the high cost of building nuclear-powered frigates and destroyers proved too costly and the campaign to make all large combatants nuclear powered gained limited traction. The cost for a Leahy class frigate was $75 million – its nuclear cousin, *Bainbridge*, cost $150 million. Unique *Long Beach* cost a whopping $333 million, more than a conventionally powered Forrestal-class carrier.

Bainbridge and *Enterprise* steaming together in the Atlantic on February 7, 1963. The following year, together with the USN's other nuclear ship of the time, *Long Beach*, the all-nuclear task force conducted a circumnavigation of the globe with an average speed of 25 knots. (Naval History and Heritage Command)

Though they never saw combat against the Soviets, missile frigates and cruisers were very active during the Vietnam War. Their

primary duties involved steaming in the Gulf of Tonkin, escorting carriers, and performing plane guard duties. Keeping track of the airspace over the Gulf of Tonkin and North Vietnam was known as Positive Identification Radar Advisory Zone (PIRAZ) duty. The missile frigates and cruisers with NTDS and long-range radars and missiles were ideally suited for this mission. PIRAZ duties were exacting because of the large number of friendly sorties over the area. In four months of 1967, *Long Beach* tracked 30,000 American aircraft sorties. In addition to tracking friendly aircraft, the PIRAZ ship was responsible for tracking North Vietnamese aircraft and vectoring US fighters against them. Air intercept controllers on cruiser *Chicago* directed 12 successful intercepts during a single deployment.

Boston firing her 8-inch guns at targets in North Vietnam on September 9, 1968. The increasing obsolescence of the Terrier missile system prompted the USN to reclassify *Boston* back to her original designation as CA-69 (a heavy cruiser) on May 1, 1968. Only the ship's heavy-gun armament kept her from being decommissioned, since she could help relieve the heavy call for fire support during the Vietnam War. (Naval History and Heritage Command)

Beginning in 1966, commanders in the Pacific Theater requested permission for Talos ships to engage targets over Vietnam. These requests were rejected by Washington for fear of hitting civilian targets or engaging friendly aircraft. Washington eventually relented in 1968. After an unsuccessful May 11 engagement, on May 23, 1968 *Long Beach* engaged a MiG at some 65 miles. The target was destroyed. This was the first time a naval SAM had destroyed an aircraft. In September *Long Beach* scored another kill at about 61 miles range. Two months later, five MiGs attacked *Biddle* manning the PIRAZ station. The frigate destroyed two of the attackers and the others fled. Not every engagement was successful. In June 1968, frigate *Jouett* fired two Terriers and missed, and *Long Beach* missed on her next five Talos shots.

USN combatants returned to the waters off North Vietnam in 1972. On April 19, a MiG attacked and damaged an American Gearing-class destroyer. Frigate *Sterett* engaged the MiGs, destroying one and claiming damage on another. *Chicago* recorded another kill with her Talos battery on May 9 at 48 miles. In addition, an ARM version (RIM-8H) of the Talos was developed and quickly fielded to attack North Vietnamese radars. *Oklahoma City* claimed a successful engagement with this weapon in 1972.

The old converted missile cruisers with 6- and 8-inch guns were extensively used for gunfire support duties. *Canberra* and *Boston*, both reclassified as heavy cruisers by this time, were especially active in this capacity. *Boston* fired so many rounds her 8-inch gun barrels were worn smooth.

The USN's surface fleet underwent a renaissance in the 1980s. This was demonstrated on April 18, 1988 when USN naval forces carried out an attack on Iranian targets in response to the mining of an American frigate four days earlier. Called Operation *Praying Mantis*, it resulted in the USN's largest surface engagement since the end of World

This is *Worden* underway in the Pacific Ocean, *c.* 1987. The ship received its full slate of modernization, including the NTU upgrade and the addition of Harpoons and Mk 15 CIWS mounts. *Worden* was the only USN missile cruiser to be attacked by friendly forces when two antiradiation missiles damaged the cruiser on April 16, 1972 off North Vietnam. (Naval History and Heritage Command)

A classic view of *Canberra* underway on January 9, 1961. The electronics fit of the USN's early missile cruisers was constantly being modified as new and better radars entered service. In this view the CXRX height-finder is on the lattice mast. Only *Boston* and *Canberra* were fitted with this radar. An SPS-29 long-range air search radar is on the pole mast, and an SPS-13 is on the radar platform. Only one SPS-13 was built. (Naval History and Heritage Command)

War II. Cruiser *Wainwright* was present and played a major role in the action. She engaged an Iranian F-4 with Standard missiles and damaged it. *Wainwright* and another ship fired five Standards at an Iranian missile craft after it fired a Harpoon at the USN ships and all five hit, causing mortal damage. American ECM prevented the Iranian Harpoon from locking on to its target. In total, American forces sank two Iranian missile craft and a frigate and damaged another frigate.

USN MISSILE CRUISERS

Boston Class

First proposed in July 1948, the first missile cruiser conversion was not funded until the FY 52 program after the outbreak of the Korean War ended the fiscal stranglehold on the USN's shipbuilding and conversion program. It was an austere conversion with only two launchers aft and a single guidance system per launcher. The forward part of the heavy cruisers was left largely intact. The two stacks were combined into one and a large lattice mast was fitted behind the forward superstructure and a pole mast aft to accommodate the new electronics suite.

Boston Class Conversions

Ship	First Commissioned	Converted at	Recommissioned	Fate
Boston (CAG 1)	June 30, 1943	NY Shipbuilding, Camden NJ	November 1, 1955	Decommissioned May 1970; scrapped 1975
Canberra (CAG 2)	August 14, 1943	NY Shipbuilding, Camden NJ	June 15, 1956	Decommissioned February 1970; scrapped 1980

Armament

The first missile-armed ships in history featured two Mk 10 Terrier launchers aft. Each launcher had a magazine that could store 72 missiles.

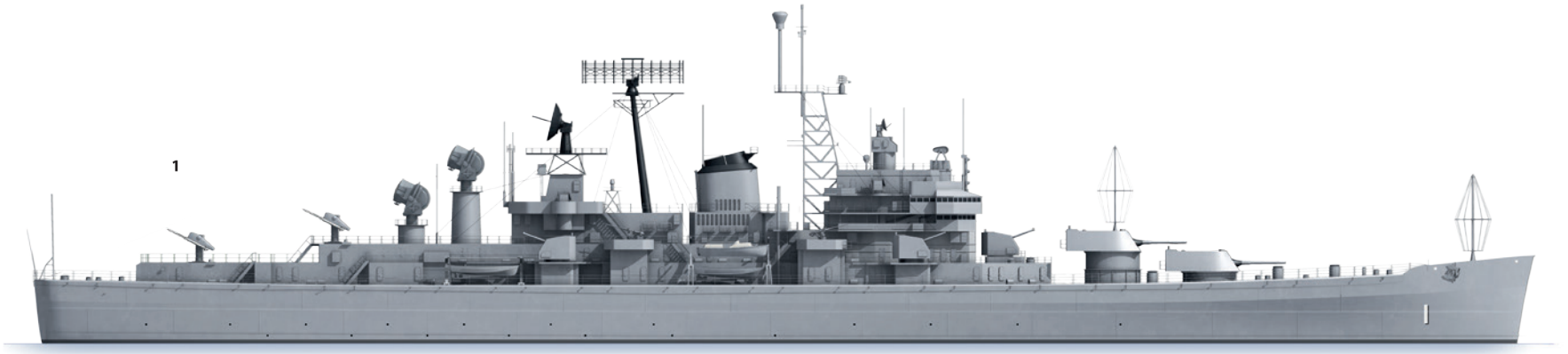
The gun battery was reduced from the original heavy cruiser fit, but it was still significant. Two of the three triple 8-inch turrets were retained, as were five of the six twin 5-inch/38 gun houses. *Boston* was completed with six twin 3-inch/50 mounts, but *Canberra* retained only

B

THE HEAVY CRUISER CONVERSIONS

1. This shows *Boston* late in her career as a missile cruiser. Her heavy cruiser origin is unmistakable, since the two forward 8-inch turrets were left in place, as were five twin 5-inch/38 gun houses. The original fit of six twin 3-inch/50 mounts has been reduced to four. An SPS-37A air search radar is on the pole mast and an SPS-30 height-finder on the radar platform aft. Note the two Terrier missile launchers and the two SPQ-5 guidance radars aft.

2. This shows *Albany* in 1976. The profile of the ship is dominated by her large bridge structure and the two tall macks. The main battery was the two Talos launchers, which are evident forward and aft with their associated SPG-49 guidance radars. An SPS-37 is on the aft mack; note the 5-inch/38 open mount at the base of the mack. Atop the forward mack is an SPS-48 radar. Since this radar had height-finding abilities, the SPS-30 has been removed from the radar platform and replaced by communications equipment.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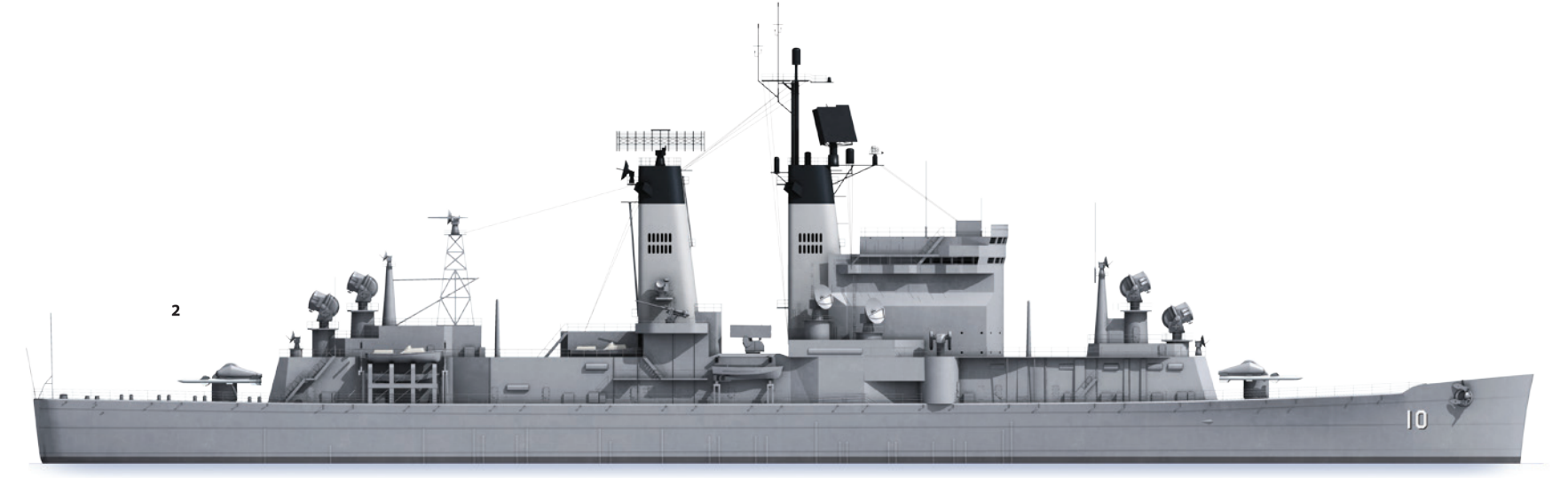
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Boston (right) and *Canberra* tied up together at Norfolk Naval Base during change of command ceremonies in 1958. Note the different guided missile guidance radars fitted to these sister ships. *Boston* was completed with the interim Mk 25 Mod 7 missile guidance radars. SPQ-5 missile guidance radars quickly replaced the Mk 25 Mod 7 on *Boston*; *Canberra* had already received them as is evident in this photograph. Carrier *Intrepid* is on the other side of the pier. (Naval History and Heritage Command)

Boston underway in Guantanamo Bay, Cuba, January 10, 1967. Her electronics suite has changed. An SPS-37A radar has been fitted on the pole mast; the CXRX has been moved to the forward lattice mast to join the SPS-10; an SPS-30 height-finding radar is on the aft radar platform. (Naval History and Heritage Command)

four. *Boston* had her two aft 3-inch twin mounts removed in 1957.

Operational Service

Boston conducted five Mediterranean deployments between 1956 and 1962. *Canberra* conducted two Mediterranean deployments before being transferred to the Pacific Fleet in 1963. By 1964 the two cruisers were no longer considered front-line units, because of the troubles with the Terrier missile system. A modernization program, which would have allowed them to fire the Standard missile, was considered, but it was judged as too expensive. Both ships reverted to their original heavy cruiser designations on May 1, 1968. *Boston* conducted three Vietnam deployments firing her last salvos against land targets on October 7, 1969. *Canberra* was active off the Vietnamese coast during four deployments from 1965 to 1968. Both ships were decommissioned in 1970.

Boston Class Specifications	
Displacement	17,685 tons full load
Dimensions	Length 673ft 5in, beam 70ft 10in, draft 32ft
Machinery	4 boilers driving 4 shafts making 120,000shp
Performance	30 kts plus
Crew	1,625

Galveston Class

These were the first ships to carry Talos missiles. All were Cleveland-class light cruisers built during World War II except for *Galveston*, which was laid up before being completed. The basis for the conversion was like that of the preceding Boston class. The forward part of the ships was left largely unaltered and the Talos system was fitted aft.

Only one ship of the class, *Galveston*, was completed to the original configuration, which left the forward superstructure and gun layout unaltered. *Galveston* kept the two forward triple 6-inch/47 gun turrets and the three forward twin 5-inch/38 gun houses. The other two ships were completed as fleet flagships to fill an urgent need for them. In order to provide the space needed for the embarked staff, the forward superstructure was extensively rebuilt and enlarged, which required that the number of guns be reduced. The flagship variants, *Little Rock* and *Oklahoma City*, retained only a single triple 6-inch/47 turret and a single 5-inch/38 twin gun house.

Both types of Talos conversions had their aft superstructure massively rebuilt to accommodate the single Talos missile launcher and its associated magazine. Two large masts and a radar platform were added to carry the new electronics suite. The two original stacks were retained.

The Cleveland-class faced critical stability issues even when completed as light cruisers. The stability problem was only exacerbated when they were converted into missile cruisers. Bulges were considered, but they were never added. *Galveston* was heavily overloaded and experienced hull cracking problems.

Galveston Class Conversions

Ship	First Commissioned	Converted at	Recommissioned	Fate
Galveston (CLG 3)	Never completed; construction suspended June 24, 1946	Philadelphia Naval Shipyard	May 25, 1958	Decommissioned May 1970; scrapped 1973
Little Rock (CLG 4)	June 17, 1945	NY Shipbuilding, Camden NJ	June 3, 1960	Decommissioned November 1976; museum ship in Buffalo NY
Oklahoma City (CLG 5)	December 22, 1944	Bethlehem Steel, San Francisco	September 7, 1960	Decommissioned December 1979; sunk as target March 1999

Armament

In addition to the gun battery already discussed, each ship carried a single Talos launcher aft. Adding the Talos made for expensive and extensive conversions because of the associated electronic suite and because the magazine for the large Talos missile penetrated the main deck into the hull. Only 46 Talos missiles were carried in the magazine, and because it was feared these could be quickly expended against saturation attacks, equipment was fitted to allow the transfer of missiles at sea.

Operational Service

Galveston had a short career as a missile cruiser before being decommissioned in 1970. After seeing service in the maritime quarantine of Cuba in 1961, she was transferred to the Pacific Fleet where she spent most of her remaining career, including service off Vietnam in 1965 performing carrier escort operations. *Little Rock* served as flagship of the Sixth Fleet and was homeported in both Villefranche, France and Gaeta, Italy. The ship conducted yearly deployments to the Mediterranean for flagship duties beginning in 1962 with occasional cruises to the North Atlantic. The cruiser rendered assistance to the intelligence collection ship *Liberty* on June 8, 1967 after she was attacked by Israeli forces. *Little Rock* was decommissioned in November 1976 after over 16 years of service as a missile cruiser. *Little Rock* is the only USN light cruiser still in existence, having been preserved as a museum ship in Buffalo, New York. *Oklahoma City* spent her entire career in the Pacific Fleet. She assumed duties as flagship of the Seventh Fleet for the first time in December 1960. In June 1965 she conducted her first tour off Vietnam, where she performed shore bombardment duties. In December 1968 her homeport was changed to Yokosuka, Japan. The cruiser covered the American evacuation from Vietnam in April and May 1975. In 1979, *Oklahoma City* was relieved as Seventh Fleet flagship by *Blue Ridge*. The cruiser had the distinction of firing the last 6-inch gun and the last Talos by a USN ship. *Oklahoma City* was decommissioned later that year after over 19 years of service as a missile cruiser.

This is *Little Rock* in the Mediterranean during her tour as Sixth Fleet flagship from August 1973 to August 1976. Note the SH-3 on the helicopter deck on the fantail; there was no hangar. There is no radar on the amidships lattice mast – it has been replaced by satellite communications equipment. An SPS-37A remains on the forward lattice mast and an SPS-30 is on the aft radar platform. (M. Brescia collection).

Galveston Class Specifications	
Displacement	15,205 tons full load
Dimensions	Length 610ft 1in, beam 66ft 4in, draft 24ft 6in
Machinery	4 boilers driving 4 shafts making 100,000shp
Performance	30kts plus
Crew	1,395

Providence Class

The three ships of this class were the Terrier equivalents to the Talos-armed Galveston class. All three were Cleveland-class light cruisers built during World War II. As with the Galveston class, one of the three ships, *Topeka*, was built in a non-flagship configuration with two forward triple 6-inch/47 gun turrets and three forward twin 5-inch/38 gun houses. The other two ships, *Springfield* and *Providence*, were built as flagships and only retained a single triple 6-inch/47 turret and a single 5-inch/38 twin gun house. The aft superstructure was rebuilt to accommodate a single Terrier launching system. The new electronics suite was fitted on the three masts. The original two stacks were retained.

Providence Class Conversions				
Ship	**First Commissioned**	**Converted at**	**Recommissioned**	**Fate**
Providence (CLG 6)	May 15, 1945	Boston Naval Shipyard	September 17, 1959	Decommissioned August 1973; scrapped 1978
Springfield (CLG 7)	September 9, 1944	Bethlehem Shipbuilding, Quincy, MA	July 2, 1960	Decommissioned May 1974; scrapped 1978
Topeka (CLG 8)	December 23, 1944	NY Naval Shipyard	March 26, 1960	Decommissioned June 1969; scrapped 1975

Armament

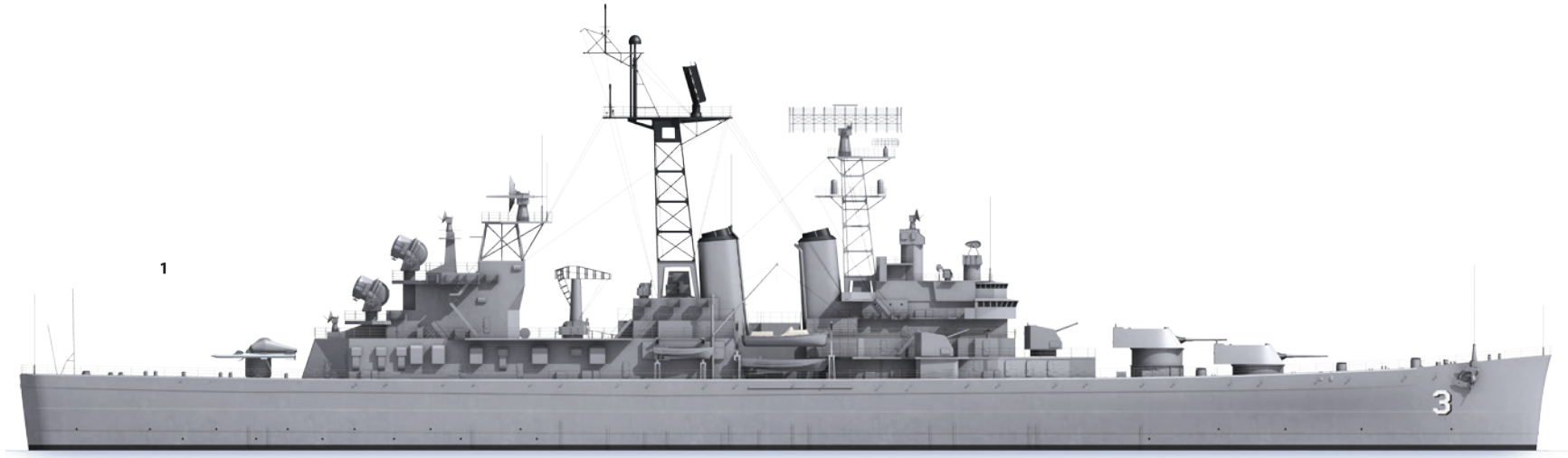
In addition to the mixed 6-inch and 5-inch gun battery, each ship carried a Mk 9 Mod 2 Terrier launcher. The magazine for the much-smaller Terrier missiles could carry 120 missiles (compared to only 46 missiles for the Talos conversions).

C

THE LIGHT CRUISER CONVERSIONS.

1. This is *Galveston* in 1970. Her pedigree as a Cleveland-class light cruiser is clearly evident in the two forward 6-inch/47 triple gun turrets and the three twin 5-inch/38 gun houses clustered around the forward superstructure. The two original stacks were also retained. The aft portion of the ship was rebuilt to house the Talos system with the magazine fitted into the new aft superstructure with the two SPG-49 guidance radars placed on top. The two lattice masts house the ship's electronics suite. On the forward mast is the small SPS-10 and the large SPS-37 air search radars. The amidships mast houses the SPS-39A radar and the aft radar platform is home to the SPS-30 height-finder.

2. This is *Little Rock* in 1960, just after her conversion. She was also converted from a Cleveland-class cruiser, but was intended to act as a flagship and had significant differences. The forward superstructure was enlarged to accommodate embarked staff personnel. This left room for only one 6-inch turret and a single 5-inch gun house. The aft portion of the ship is devoted to the Talos system and its guidance radars. The initial electronics suite of *Little Rock* comprised an SPS-10 and an SPS-17 long-range air search radar on the forward lattice mast; the amidships lattice mast held an SPS-39; on the aft radar platform was the heavy SPS-2 height-finding radar. *Little Rock* was one of only two ships to get this radar, which was later abandoned due to its complexity.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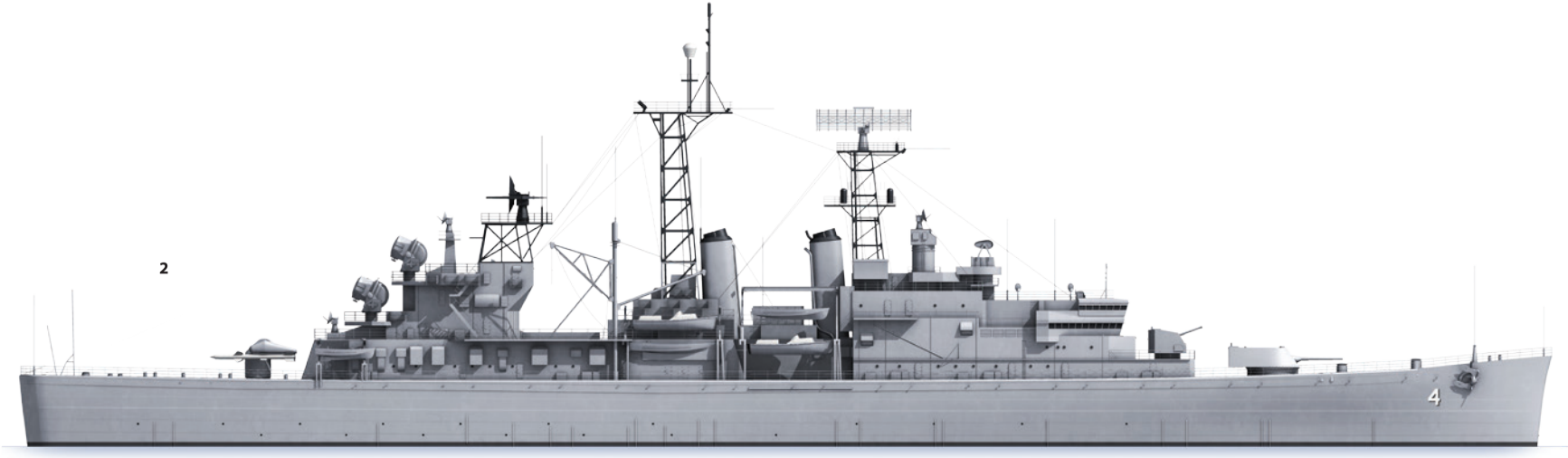
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Springfield entering Malta's Grand Harbor on March 28, 1963. The Terrier-equipped ship had a Mark 10 launcher aft and two SPQ-5 missile guidance radars. Other radars include an SPS-42 aft, the SPS-8B height-finder amidships, and an SPS-17 on the forward mast. (M. Brescia collection).

Operational Service

Providence was transferred to the Pacific Fleet in 1960 and in 1962 relieved *Oklahoma City* temporarily as Seventh Fleet flagship. She again relieved *Oklahoma City* as Seventh Fleet flagship and was based at Yokosuka from December 1966 until November 1968. During this time, she was active off Vietnam conducting a number of shore bombardment missions. *Providence* returned to Vietnam for an extended deployment in 1972 before being decommissioned the following year.

Springfield saw service as flagship of both the Second and Sixth Fleets. In December 1960, she relieved heavy cruiser *Des Moines* as Sixth Fleet flagship. After a refit, she returned to the Mediterranean and was homeported at Villefranche until being relieved by *Little Rock* in January 1967. In September 1967, she relieved heavy cruiser *Newport News* as Second Fleet flagship until July 1969. *Springfield* briefly resumed duties as Second Fleet flagship in January 1970. In August 1970, she deployed to the Mediterranean and replaced *Little Rock* as Sixth Fleet flagship and was homeported in Italy. The cruiser was relieved of flagship duties by *Little Rock* in September 1973 and decommissioned the following year.

Topeka was not fitted as a fleet flagship and consequently had a short career of only nine years as a missile cruiser. She spent her entire career in the Pacific Fleet with the exception of two brief deployments to the Mediterranean. She conducted two Vietnam deployments and used her gun battery for shore bombardment during the second deployment.

Providence Class Specifications	
Displacement	15,205 tons full load
Dimensions	Length 610ft 1in, beam 66ft 4in, draft 24ft 6in
Machinery	4 boilers driving 4 shafts making 100,000shp
Performance	30kts plus
Crew	1,120

Springfield pictured in Malta's Grand Harbor on November 18, 1970. She assumed Sixth Fleet flagship duties in August and remained in the Mediterranean until September 1973. Her electronics fit has been altered with an SPS-37A on the foremast, an SPS-30 amidships, and an SPS-42 on the aft mast. (M. Brescia collection).

Albany Class

Unlike the previous missile cruisers, the SCB 173 design, which became the Albany class, was a full conversion. All the ships selected for conversion were stripped down to their main decks and had all their armament removed. The resulting conversion resulted in a dramatic new ship both in appearance and capabilities. The ships were fitted with four surface-to-air launchers and an ASROC launcher, making them the most powerful missile ships in the fleet.

Conversion of the first ship, *Chicago*, was placed in the FY 58 plan. Work on the other two was deferred to the FY 60 plan. *Albany* replaced *Oregon City*, because she was in better condition. *Columbus* was substituted for *Fall River*, since it was cheaper to take her out of service and convert her instead of bringing *Fall River* out of reserve. Planned conversions of *Rochester* and *Fall River* were later canceled.

After the original superstructures had been removed, the new superstructures were made of ½ inch-thick aluminum plates to save weight, and steel was not used to cover vital areas, including the missile magazines. The most distinctive aspect of the design was the tall, boxy bridge, rounded in front, that housed the missile control systems. Even taller (104 feet) were the two macks. The extensive electronics suite was placed on top of the macks and a radar platform fitted aft. Each ship could act as a flagship, since they had space for command staff.

Albany Class Conversions

Ship	First Commissioned	Converted at	Recommissioned	Fate
Albany (CG 10)	June 11, 1946	Boston Naval Shipyard	November 3, 1962	Decommissioned August 1980; scrapped 1990
Chicago (CG 11)	January 10, 1945	San Francisco Naval Shipyard	May 2, 1964	Decommissioned March 1980; scrapped 1990
Columbus (CG 12)	June 8, 1945	Puget Sound Naval Shipyard	December 1, 1962	Decommissioned January 1975; scrapped 1976

Armament

The main weapon of these powerful ships was the Talos missile system. A Mk 12 launcher was placed forward and aft. The Talos magazines were placed entirely in the hull for the first time. Each magazine accommodated

Albany in Malta's Grand Harbor on April 9, 1971 during her fifth Mediterranean deployment. The lead ship in the class was the first "double-ender" Talos conversion. The Mk 11 launcher for the Tartar missile is visible at the base of the forward superstructure with its SPG-51 missile guidance radars. The principal radars include the SPS-48 3-D air search radar and the SPS-10 surface search radar on the forward mack, the SPS-43 on the aft mack, and an SPS-30 on the radar platform. (M. Brescia collection)

Albany in the Mediterranean in November 1972. Besides the missile launchers, the ship has been fitted with an ASROC launcher located between the macks, a single 5-inch/38 open mount located at the base of the aft mack, and a Mk 32 triple torpedo mount located on the main deck just abaft of the Mk 13 missile launcher. (M. Brescia collection)

52 missiles, which were all stowed assembled. Supplementing the long-range Talos was the short-range Tartar system. Two Mk 11 Tartar launchers were placed on each beam on either side of the bridge structure. The magazine for each launcher contained 40 missiles.

The original design of these ships included space for eight Polaris sea-launched ballistic missiles (SLBM). When the nuclear-powered ballistic missile submarine emerged as a superior SLBM platform, the Regulus II surface-to-surface missile was considered as a replacement, but the system was not fitted to save money. In its place, an ASROC launcher was fitted. The class was equipped with an SQ-23 sonar and two triple Mk 32 torpedo tube mounts to give it a full slate of ASW capabilities. Also located amidships was a pair of single 5-inch/38 open mounts for self-defense. These were added after completion.

In 1967–68, *Albany* was modernized. She received the NTDS and the powerful SPS-48 3-D air search radar. In a 1973–74 modernization for duties as Second Fleet flagship, her remaining SPS-30 radar was replaced by a communications antenna. *Columbus* was never modernized and was the first ship of the three to be decommissioned in 1975. *Chicago* was also not modernized. The unmodernized ships were decommissioned in 1980, by which time their Talos batteries were already out of service.

Operational Service

Albany was the first to commission. She spent her entire career in the Atlantic Fleet. Around her modernization periods mentioned above, she conducted six deployments to the Mediterranean before being homeported in Gaeta, Italy from 1976 to 1980 as Sixth Fleet flagship. She also served as Second Fleet flagship in 1975. After being decommissioned in 1980, she was kept in reserve until 1985 when she was stricken.

This view shows *Columbus* moored in Taranto on November 15, 1970. There has been no change from her 1966 configuration. *Columbus* never received an extensive modernization and was decommissioned five years before her sister ships. (M. Brescia collection).

Chicago was assigned to the Pacific Fleet after her commissioning and made her first deployment to Vietnam in 1966. During her Vietnam deployments, she served as PIRAZ ship in the Tonkin Gulf. In this capacity, she controlled USN fighters and received credit for 12 kills. In 1972, on her fifth Vietnam deployment, she coordinated the antiair protection for the operation to mine Haiphong harbor. On one occasion, her Talos shot down a MiG at 48 miles. In total, she made nine deployments to the Western Pacific until being decommissioned in 1980 and stricken in 1984.

Columbus had the shortest career, lasting only 12 years. After a single Western Pacific deployment, she transferred to the Atlantic Fleet and conducted seven Mediterranean deployments before being decommissioned in 1975.

Albany Class Specifications	
Displacement	18,900 tons full load
Dimensions	Length 673ft 5in, beam 70ft 10in, draft 33ft
Machinery	4 boilers driving 4 shafts making 120,000shp
Performance	30kts plus
Crew	1,272

Leahy Class

This class was designed and built as guided missile frigates; they were reclassified as cruisers on June 30, 1975. Three ships were authorized in the FY 58 program and the other six in FY 59. These were well-balanced ships that introduced the mack. The ships were longer than the preceding Coontz class and were fitted with a hurricane bow with a knuckle that made them good sea boats and kept the forward Terrier launcher dry.

The machinery of the Coontz class was retained to save money. The hull was lengthened and modified to increase endurance and to create more internal volume. This allowed 80 Terrier missiles to be carried, 40 for each launcher. The superstructure was also enlarged to permit for a very large combat information center.

Leahy Class Construction

Ship	Built By	Laid down	Launched	Commissioned	Fate
Leahy (CG 16)	Bath Iron Works, Bath Maine	December 3, 1959	July 1, 1961	August 4, 1962	Decommissioned 1993; scrapped 2005
Harry E. Yarnell (CG 17)	Bath Iron Works	May 31, 1960	December 9, 1961	February 2, 1963	Decommissioned 1993; scrapped 2002
Worden (CG 18)	Bath Iron Works	September 19, 1960	June 2, 1962	August 3, 1963	Decommissioned 1993; sunk as target 2000
Dale (CG 19)	NY Shipbuilding, Camden NJ	September 6, 1960	July 28, 1962	November 23, 1963	Decommissioned 1994; sunk as target 2000
Richmond K. Turner (CG 20)	NY Shipbuilding, Camden NJ	January 9, 1961	April 6, 1963	June 13, 1964	Decommissioned 1995; sunk as target 1998
Gridley (CG 21)	Puget Sound Bridge and Dredge Co., Seattle WA	July 15, 1960	July 31, 1961	May 25, 1963	Decommissioned 1994; scrapped 2005
England (CG 22)	Todd Shipyards, San Pedro, Los Angeles CA	October 4, 1960	March 6, 1962	December 7, 1963	Decommissioned 1994; scrapped 2004
Halsey (CG 23)	San Francisco Naval Shipyard	August 26, 1960	January 15, 1962	July 20, 1963	Decommissioned 1994; scrapped 2003
Reeves (CG 24)	Puget Sound Naval Shipyard	July 1, 1960	May 15, 1962	May 15, 1964	Decommissioned 1993; sunk as target 2001

Armament

These ships were completed with two twin Terrier launchers and carried 80 SAMs. They were given a full ASW suite with an ASROC launcher forward, a triple Mk 32 torpedo mount on each beam, and an SQS-23 sonar forward. Two twin 3-inch/50 mounts were fitted for close-in air defense. Of note, the ships did not carry a 5-inch gun, which limited their utility in surface combat and gave them no capability to conduct shore bombardment.

Richmond K. Turner underway off San Diego, California on February 13, 1970 before she received her antiair modernization. Radars on the forward mack include the SPS-10 and the SPS-39 3-D air search radar. An SPS-43 2-D air search radar is fitted atop the aft mack. (Naval History and Heritage Command)

Between 1967 and 1972, the class underwent antiair modernization, which included fitting the NTDS and adapting the missile launchers to fire Terrier or Standard SM-1ER missiles. More significant was the New Threat Upgrade (NTU) carried out on all ships of the class beginning in the late 1980s. This was an extensive and comprehensive upgrade covering all areas of the ship. NTU work included new radars, a new combat system, a new fire control system, and upgraded launchers to fire the Standard SM-2ER. The new radars included an SPS-48 on the foremast, SPS-49 2-D air search radar aft, and improved SPG-55B missile guidance radars. The 3-inch mounts were removed and eventually replaced by two Phalanx mounts and two quad Harpoon launchers. Other work upgraded the food service areas and overhauled the propulsion system.

Operational Service

These ships were maximized for air defense and thus were usually assigned to carrier escort duties. Of the nine ships, seven were deployed off Vietnam, most conducting multiple deployments. Seven of the class were active during the Gulf War in 1991. After their NTU upgrade, these were some of the premier air defense ships in the fleet, but they were decommissioned fairly shortly thereafter, beginning in 1993.

Leahy Class Specifications	
Displacement	4,650 tons standard, 7,630 tons full load raising to 8,200 tons by 1985
Dimensions	533ft length, 54ft 10in beam, 24ft 6in draft
Machinery	4 boilers driving 2 shafts making 85,000shp
Performance	34kts
Crew	423 (1987)

Belknap Class

The biggest complaint about the Leahy class was the absence of a large gun. The Belknap class addressed this shortcoming by substituting a single 5-inch/54 gun mount for the aft Terrier launcher. Overall, the Belknap class was larger and heavier than the Leahy class, making the new ships excellent sea boats. These balanced ships were the most successful missile frigates.

The nine ships were authorized in 1961–62. Completed as missile frigates, they were reclassified as cruisers on June 30, 1975. These were attractive ships with their two macks and two superstructures. They possessed important differences from the Leahy class. They lacked a separate ASROC launcher in front of the forward superstructure and were fitted with a helicopter deck forward of the 5-inch gun mount. A 14-foot hull section

Harry E. Yarnell entering Malta's Grand Harbor in February 1967. Terriers have been run out on all four rails of the Mk 10 launchers. All nine of the Leahy-class ships received an antiair modernization from 1967 to 1972, all but one at Bath Iron Works. (M. Brescia collection)

was inserted amidships to provide the extra space for a dedicated hangar. Space was adequate for three Drone Antisubmarine Helicopters (DASH) or one HU2K utility helicopter, and later for the SH-2 Seasprite helicopter.

Belknap Class Construction

Ship	Built By	Laid down	Launched	Commissioned	Fate
Belknap (CG 26)	Bath Iron Works, Bath Maine	February 5, 1962	July 20, 1963	November 7, 1964	Decommissioned 1995; sunk as target 1998
Josephus Daniels (CG 27)	Bath Iron Works	April 23, 1962	December 2, 1963	May 8, 1965	Decommissioned 1994; scrapped 1999
Wainwright (CG 28)	Bath Iron Works	July 2, 1962	April 25, 1964	January 8, 1966	Decommissioned 1993; sunk as target 2002
Jouett (CG 29)	Puget Sound Naval Shipyard	September 25, 1962	June 30, 1964	December 3, 1966	Decommissioned 1994; sunk as target 2007
Horne (CG 30)	San Francisco Naval Shipyard	December 12, 1962	October 30, 1964	April 15, 1967	Decommissioned 1994; sunk as target 2008
Sterett (CG 31)	Puget Sound Naval Shipyard	September 25, 1962	June 30, 1964	April 8, 1967	Decommissioned 1994; scrapped 2005
William H. Standley (CG 32)	Bath Iron Works	July 29, 1963	December 19, 1964	July 9, 1966	Decommissioned 1994; scrapped 2005
Fox (CG 33)	Todd, San Pedro	January 15, 1963	November 21, 1964	May 28, 1966	Decommissioned 1994; scrapped 2003
Biddle (CG 34)	Bath Iron Works	December 9, 1963	July 2, 1965	January 21, 1967	Decommissioned 1993; scrapped 2002

This port beam view of *Wainwright* shows the ship's hangar, which had space for one SH-2F ASW helicopter. Also visible is the placement of the Mk 15 CIWS mount, which was placed on a platform abreast the hangar and the Mk 141 Harpoon launcher, which occupies the space of the original 3-inch/50 mount. (M. Brescia collection)

Belknap-class cruiser *Josephus Daniels* shown late in her career after a full slate of upgrades. An SPS-48C radar occupies the forward mack and an SPS-49 sits atop the aft mack. Also note the presence of a Mk 15 CIWS mount and a quad Harpoon launcher abreast the hangar. These improvements, in addition to a reliable missile in the form of the Standard ER, made these ships formidable antiair platforms.
(M. Brescia collection)

Armament

These ships were completed with a single Mk 10 Mod 7 launcher forward. The new launcher was capable of firing Terrier missiles or ASROCs. The magazine was expanded to carry a total of 60 weapons – 40 Terriers and 20 ASROCs. ASW continued to be a design priority and the ships were given an enhanced ASW suite. In addition to the ability to fire ASROCs, a more powerful sonar (SQS-26) was fitted, and for the first time space was provided for a helicopter deck and hangar. As completed, the class had two fixed Mk 25 torpedo tubes fitted with 10 reloads. These were soon removed and replaced with two triple Mk 32 torpedo mounts. Two twin 3-inch/50 mounts were fitted for close-in air defense.

In the early 1980s, the class received Standard SM-1 missiles to replace the Terriers. Almost the entire class was upgraded, beginning in the late 1980s with the NTU package. The missile launchers were adapted to fire Standard SM-2ER missiles and the electronics suite upgraded with the addition of the SPS-48, SPS-49, and SPG-55B radars. The 3-inch mounts were removed and later replaced by two Phalanx mounts and two quad Harpoon launchers.

Belknap did not receive the NTU package. In November 1975 she collided with carrier *John F. Kennedy* and was severely damaged. From 1976 to 1980, she was reconstructed and Harpoon and Phalanx were added. *Belknap* underwent additional modification as a fleet flagship from 1985 to 1986. During this time the helicopter hangar was converted into berthing, the helicopter deck expanded, and additional superstructure space created forward and amidships.

Operational Service

These ships were considered very successful in service. Of the nine ships in the class, all were deployed off Vietnam for multiple deployments. Three ships were active during the Gulf War in 1991.

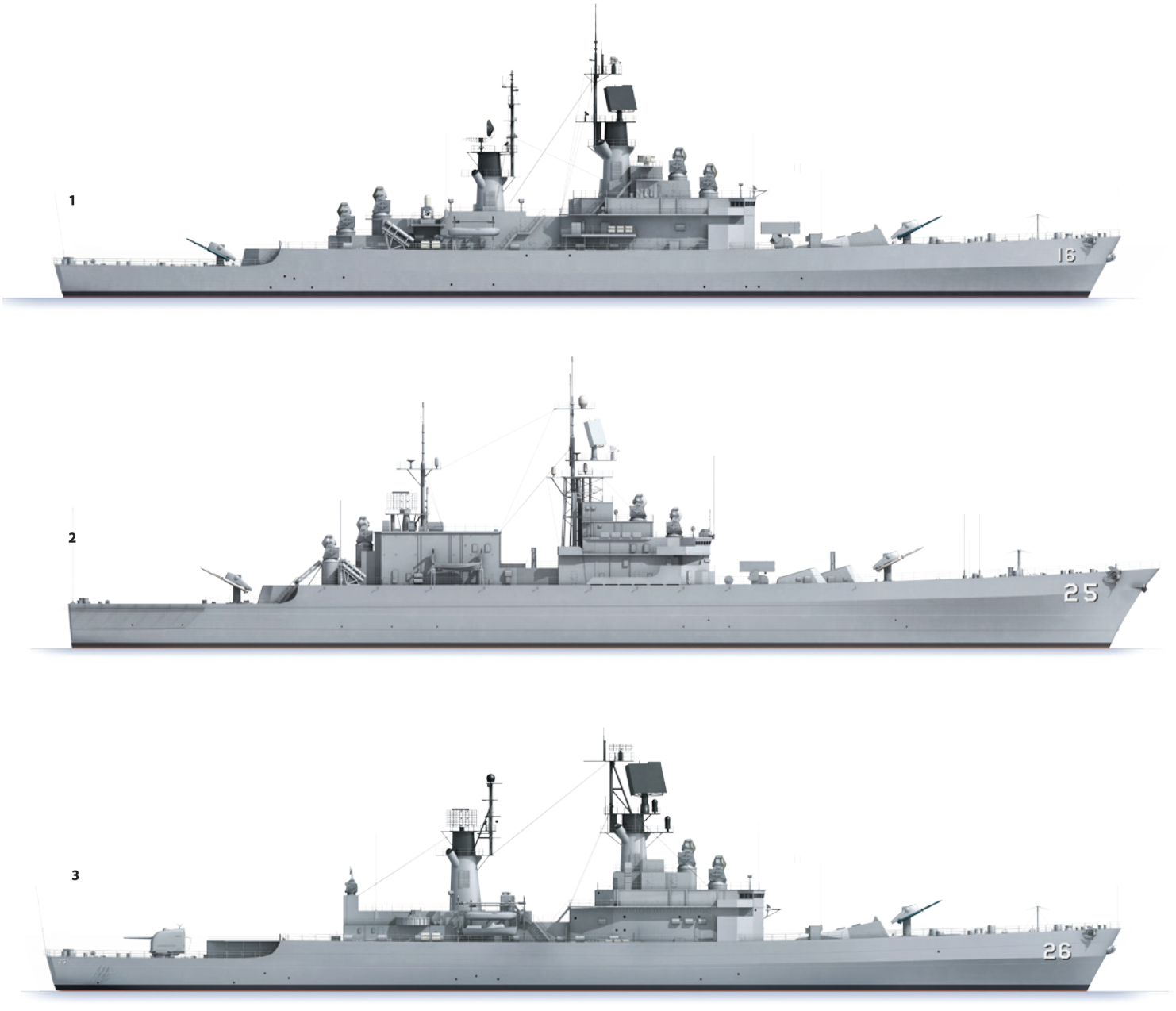
D

LEAHY AND BELKNAP CLASSES.

1. This is a Leahy-class cruiser as they appeared late in their careers. The ships were "double-enders," as shown by a Mk 10 missile launcher forward and aft. The missiles are controlled by four SPG-55D guidance radars placed on the forward and aft superstructures. ASW equipment included an SQS-23 bow sonar, a Mk 16 ASROC launcher in front of the forward superstructure and two Mk 32 triple torpedo tube mounts. Located abaft the after mack were two Mk 15 CIWS mounts and two Mk 141 quad Harpoon launchers.

2. This is *Bainbridge* in her original configuration. She was a nuclear-powered version of the Leahy class and shared the same basic armament layout. She lacked the macks of the Leahy class and instead mounted her electronics suite on a forward lattice mast and a pole mast aft.

3. This is a Belknap-class missile cruiser in its original configuration. The class shared much with the Leahy class, but had some important differences. Note the absence of an ASROC launcher forward. A Mk 42 5-inch/54 gun mount has replaced the aft Mk 10 missile launcher. For the first time, a missile cruiser was provided with a helicopter deck and a hangar.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ABOVE LEFT
Fox underway in the Pacific Ocean in December 1988 showing the late-career configuration of Belknap-class cruisers. The major modifications are the Mk 15 CIWS mounts and quad Harpoon launchers fitted abreast the hangar. The helicopter is the USN's first dedicated ASW helicopter, the SH-2 Seasprite. This aircraft was designed to extend the ASW range of surface combatants by operating beyond the sensor range of the parent ship and sending back data. Entering service in 1970, its endurance was five hours and it carried radar, two torpedoes, or an antiship missile. (Naval History and Heritage Command)

ABOVE RIGHT
This 1990 view of *Belknap* shows the ship after her conversion into Sixth Fleet flagship. The conversion took place from May 1985 to February 1986. A fleet command center, improved communications, and new facilities and berthing for the fleet staff were added. The hangar was converted to berthing space and the deck enlarged to operate SH-3 Sea King helicopters. In this view the additional spaces in front of the bridge are evident, as are the expanded forward and aft superstructures. The ship retains two Phalanx mounts and two Harpoon quad launchers. (M. Brescia collection)

Belknap had the most notable career, marked by the collision with *John F. Kennedy* on November 22, 1975. Seven crew members were killed, and the entire aluminum superstructure was destroyed by fire. This event was a major contributing factor to the USN's decision to go back to all steel for use in future surface combatants. *Belknap* underwent a 5-year conversion and reconstruction, emerging in May 1980. Between May 1985 and February 1986, she was converted into a flagship, after which she changed her homeport to Gaeta as Sixth Fleet flagship. On December 2, 1989, she was the scene of a summit between President George H.W. Bush and Soviet President Mikhail Gorbachev at Malta.

Belknap Class Specifications	
Displacement	5,340 tons standard, 7,900 tons full load
Dimensions	Length 547ft, beam 54ft 10in, draft 29ft
Machinery	4 boilers driving 2 shafts making 85,000shp
Performance	33kts
Crew	477

THE NUCLEAR CRUISERS

Long Beach

Long Beach was the only USN missile cruiser designed and built as such from the keel up. She was also the first nuclear-powered surface ship in the world and the first warship planned entirely with missiles as its armament. The ship had a very unusual appearance, since her forward superstructure was built in the shape of a blockhouse and covered with the antennae of electronically-scanned radars. The fixed arrays were unique systems only fitted to *Long Beach* and the carrier *Enterprise*, and they proved hard to maintain.

The ship's top speed was over 30 knots from two reactors. Reactor power was limited, so the ship was given a long hull to enable her to reach the design speed. In case of failure by the reactors, the ship was equipped with a back-up diesel. The reactors proved successful in service, steaming 167,000nm before they were refueled.

Jouett shown here underway on March 12, 1976 made four Vietnam deployments, responded to a Korean crisis in 1969, deployed to the Indian Ocean in 1979–80, and saw action in the First Gulf War. (Naval History and Heritage Command)

***Long Beach* Construction**					
Ship	**Built By**	**Laid down**	**Launched**	**Commissioned**	**Fate**
Long Beach (CGN 9)	Bethlehem Shipbuilding, Quincy, MA	December 2, 1957	July 14, 1959	September 9, 1961	Decommissioned May 1995; hull towed to Bremerton where she remains in long-term storage

Armament

Long Beach's all-missile battery was comprised of a Mk 12 Talos launcher aft and two twin Mk 10 Terrier launchers forward. Magazine capacity totaled 46 Talos and 240 Terrier missiles. Design space was reserved for the Regulus II cruise missile amidships and the ship was also built with foundations in place for eight Polaris ballistic-missile launch tubes. This space was eventually occupied by an ASROC launcher, which supplemented the two Mk 32 triple torpedo launchers for ASW. The ship carried an SQS-23 sonar. *Long Beach* was designed without any guns, which meant she would have been defenseless against small craft and slow-flying aircraft. To counter these threats, two single 5-inch/38 gun houses were placed amidships.

The cruiser received a nuclear refueling in 1971–72. By 1979, the Talos launcher and its guidance radars had been removed. After some brief consideration of rebuilding *Long Beach* as a strike cruiser, it was decided to give her another modernization beginning in October 1980, which was completed in March 1983. The fixed radar antennae were removed, but the blockhouse superstructure remained. In their place, SPS-49 2-D and SPS-48 3-D air search radars were added. Two quad packs of Harpoons were placed aft on the quarterdeck and two Phalanx mounts were fitted aft where the Talos missile guidance radars had been. In 1985, two Tomahawk ABLs were added.

***Long Beach* Specifications**	
Displacement	14,200 tons standard, 17,100 tons full load
Dimensions	721ft 3in length, 73ft 3in beam, 29ft 8in draft
Machinery	2 reactors driving 4 shafts making 80,000shp
Performance	30kts plus
Crew	958

Service

The ship was active for more than 30 years, which included a nuclear recore and a major modernization. *Long Beach* began her career in the

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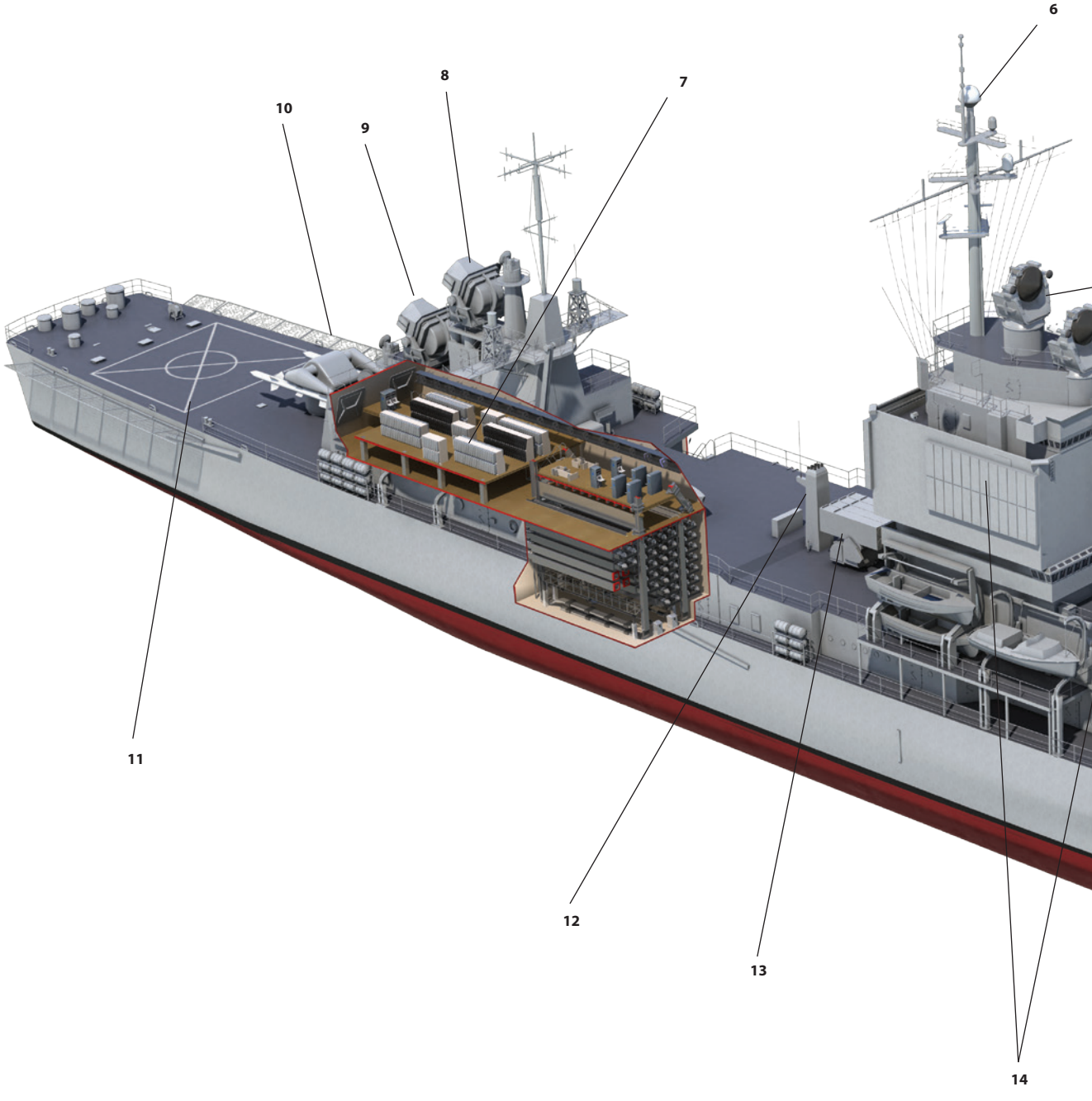
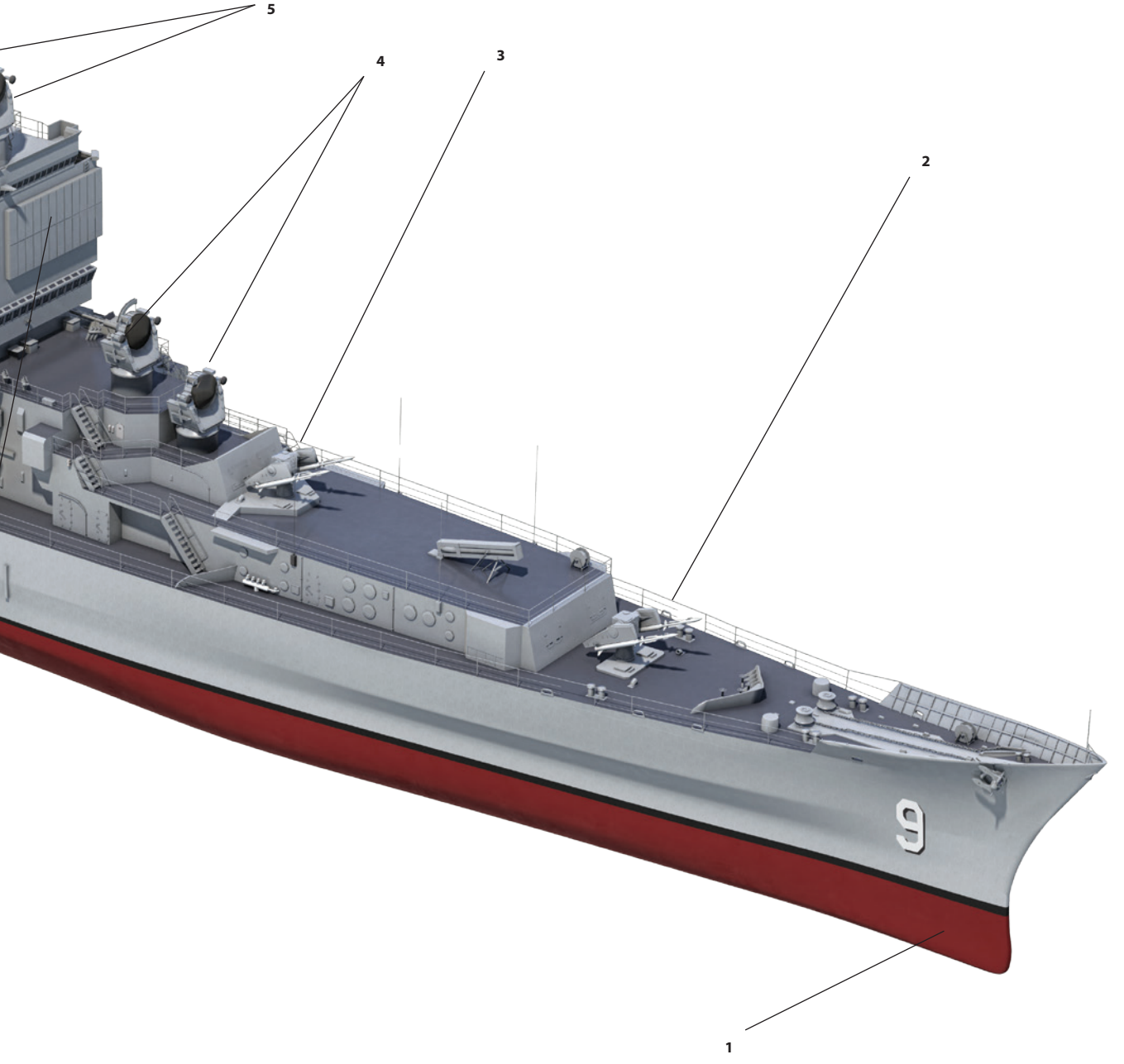
LONG BEACH

This cutaway artwork depicts *Long Beach* as she appeared when first commissioned. The cruiser was the first purpose-built and the largest USN missile cruiser.



Key

1. SQS-23 bow sonar
2. Mk 10 Terrier missile launchers
3. Mk 10 Terrier missile launchers
4. SPG-55 (2)
5. SPG-55 (2)
6. TACAN
7. Talos magazine
8. SPQ-49 /SPW-2
9. SPQ-49/SPW-2
10. MK 12 Talos missile launcher
11. Helicopter deck
12. Exhaust stack for waste furnace
13. ASROC launcher
14. SPS-32 (2)



Long Beach, the USN's only guided missile cruiser designed and built as such, shown underway off Oahu, Hawaii, May 9, 1973. The ship was large enough to carry both the Talos and Terrier missile systems, the only USN ship to do so. In this view the two forward Mk 10 launchers for the Terriers are visible, as are the two sets of SPG-55 missile guidance radars. The Talos system is located aft (seen with two missiles on the rails) along with their SPG-49 guidance radars. The ship's appearance is dominated by the huge forward superstructure and its SPS-32/33 3-D radars. (Naval History and Heritage Command)

Atlantic Fleet and on her second Mediterranean deployment formed part of Nuclear Task Force 1 with *Enterprise* and *Bainbridge* in May 1963. In July, the task force commenced an around-the-world cruise with *Long Beach* returning to the United States in October of the following year. In 1966, *Long Beach* was transferred to the Pacific Fleet. The ship conducted a total of 14 deployments to the Western Pacific during her active service. Three of these were off Vietnam, where she operated primarily in the Gulf of Tonkin providing air defense coverage for the carriers flying strikes into North Vietnam. In 1968 during her second Vietnam deployment, *Long Beach* shot down two MiGs over North Vietnam. After returning to the Atlantic Fleet, she was decommissioned in 1994.

Bainbridge

The design of the first nuclear-powered missile frigate was based on the Leahy class and the ship possessed the same general layout. Instead of the macks, two lattice masts were fitted. Building nuclear-powered ships was not without controversy. The inclusion of nuclear propulsion imposes a severe cost in size, complexity, and cost. However, nuclear propulsion seemed to solve the biggest problem facing the destroyer's lack of endurance. However, not everybody agreed that this was worth the added expense. Admiral Burke, then CNO, approved inclusion of a nuclear missile frigate in the FY 59 program. *Bainbridge* was completed in 1962, but she came in way over budget. The ship had to be lengthened by 32 feet from the conventional Leahy class, because of the reduced power of the nuclear reactor as opposed to the steam plants then in service to keep a favorable speed to length ratio. The size requirements of the nuclear reactor and her increased crew also required a longer hull.

***Bainbridge* Construction**

Ship	Built By	Laid down	Launched	Commissioned	Fate
Bainbridge (CGN 25)	Bethlehem Shipbuilding, Quincy MA	May 15, 1959	April 15, 1961	October 6, 1962	Decommissioned 1996; scrapped Bremerton 1999

Armament

Bainbridge was the nuclear sister to the Leahy class and carried the same armament. She was completed with two twin Terrier launchers with a total of 80 missiles in the magazines. *Bainbridge* was provided with a full ASW suite with an ASROC launcher forward, a triple Mk 32 torpedo mount on each beam, and an SQS-26 sonar forward, but there was no space for an ASW helicopter. Two twin 3-inch/50 mounts were fitted for close-in air defense.

Her first nuclear refueling began in August 1967. Between 1974 and 1977, *Bainbridge* underwent an antiair modernization, which adapted the missile launchers to fire Standard SM-1ER missiles and received her second

refueling. Harpoon was fitted during a yard period in 1978–79. The ship received its final nuclear refueling and the NTU upgrade during a major modernization from October 1983 to April 1985, which included the outward additions of the SPS-49 radar and two Phalanx mounts.

Operational Service

Bainbridge conducted a round-the-world cruise with *Enterprise* and *Long Beach*, commencing in 1963. She conducted five Vietnam deployments and participated in the 1991–92 Gulf War. The ship was deactivated in August 1995 and held in reserve until being decommissioned in September 1996.

***Bainbridge* Specifications**	
Displacement	7,850 tons standard, 8,580 tons full load
Dimensions	565ft length, 57ft 10in beam, 24ft 6in draft
Machinery	2 reactors driving 2 shafts making 60,000shp
Performance	30kts plus
Crew	497 (1962)

Truxtun

Truxtun was the USN's third nuclear-powered missile combatant. She was designed and completed as a frigate, but she was reclassified as a cruiser in 1975. She was broadly based on the Belknap class, at least in terms of her armament, but given her many differences, she was clearly a separate class. The much-increased cost of nuclear power meant the USN was lukewarm about additional nuclear missile frigates. The USN did not request another nuclear frigate as part of the Belknap class, but Congress substituted a nuclear ship for one of them. The ship was envisioned to be a repeat *Bainbridge*, but the USN decided to incorporate the improvements from the Belknap class and use the *Bainbridge* hull to the maximum extent possible. The arrangement of the armament was switched around from that on the Belknap class. In addition, *Truxtun* was longer and larger than the Belknap-class ships, because of the nuclear power plant.

***Truxtun* Construction**					
Ship	**Built By**	**Laid down**	**Launched**	**Commissioned**	**Fate**
Truxtun (CGN 35)	NY Shipbuilding, Camden NJ	June 17, 1963	December 19, 1964	May 27, 1967	Decommissioned 1995; scrapped Bremerton 1999

Bainbridge transiting the Suez Canal on February 27, 1992 en route to the Mediterranean Sea. The ship is a "double ender" and shares the same basic layout as the Leahy class. This is the ship in her final configuration with Harpoon fitted where the 3-inch/50 twin gun mounts originally were and the addition of two Mk 15 CIWS mounts atop the aft superstructure. (Naval History and Heritage Command)

Armament

Truxton carried the same armament as the Belknap class but in different positions. The 5-inch/54 Mark 42 gun mount was placed forward of the bridge structure and the Mk 10 Mod 7 missile launcher moved abaft the helicopter deck. The missile magazine accommodated 40 Terriers

Truxtun pictured underway shortly after her commissioning in May 1967. The ship was the nuclear cousin of the Belknap class, but with significant differences. The arrangement of the armament was altered, and a lattice mast replaced the macks found on the Belknaps. (Naval History and Heritage Command)

and 20 ASROCs. *Truxtun*'s ASW suite remained strong with an ASROC launcher, the SQS-26 sonar, two fixed Mk 32 torpedo tubes and space for a helicopter. Two twin 3-inch/50 mounts were retained for close-in air defense.

Truxtun received the typical upgrades for USN missile ships of the period, but it did not receive the full NTU upgrade. Standard SM-1 missiles replaced the unreliable Terriers. In 1971, the hangar was modified to support the SH-2 Seasprite. In 1979, the 3-inch mounts were replaced with two quad Harpoon launchers. The ship's nuclear powerplant was refueled between 1982 and1984, two Phalanx mounts were added, and the electronic suite was upgraded.

Operational Service

Truxtun had a busy 28-year career. Initially assigned to the Pacific Fleet, she made her first Vietnam deployment in 1968 acting as the PIRAZ ship in the Tonkin Gulf. She returned to Vietnamese waters in 1969, 1971, 1972, and 1973. During the 1972 Vietnam deployment she was credited with the guiding of fighter intercepts that resulted in the destruction of 11 enemy aircraft and the rescue of three downed American aviators. During her career she conducted a total of 14 Western Pacific deployments.

***Truxtun* Specifications**	
Displacement	8,250 tons standard; 9,050 tons full load
Dimensions	Length 565ft, beam 58ft, draft 30ft 6in
Machinery	2 reactors driving 2 shafts making 60,000shp
Performance	30kts plus
Crew	492

California Class

The two ships of this class were designed and built as missile frigates. Right after being completed, they were reclassified as missile cruisers. Reflecting the confusion in the USN's naming convention (which still continues), these frigates were named after states to reflect their size and capabilities. Despite their cost, the USN needed nuclear-powered missile ships to escort the nuclear-powered carrier *Nimitz*, which was authorized in 1967. Without nuclear escorts, the operational flexibility offered by a nuclear-powered

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THE FIRST NAVAL SAM KILL

On May 23, 1968, *Long Beach* became the first USN ship to shoot down an aircraft with a SAM. This scene shows the missile cruiser firing two long-range Talos SAMs at an unseen MiG over North Vietnam. The launcher is a Mk 12. By 1968, Talos had become a reliable system and the latest version introduced semi-active terminal homing, which gave the missile better low-altitude performance. The missile had a continuous-rod warhead, which had a lethal radius of 100 feet. The radar directors are the SPG-49, which had reliability issues throughout its career. By 1979, the Talos system was retired due to the reliability problems with the SPG-49 and the declining number of platforms available to carry it. It was doctrine to fire two missiles at a single target to increase the kill probability. On this occasion, one of the missiles hit its target 65nm away, marking the first time in history that a naval SAM shot down an enemy aircraft.

9
LONG BEACH

This view of *South Carolina* shows the air defense capabilities of the ship. The Mk 13 Mod 3 launchers for Tartar/Standard MR missiles are located forward and aft. Placed near the missile launchers are Mk 45 5-inch/54 guns. The electronics suite includes four SPG-51D missile guidance radars, an SPS-48C 3-D air search radar on the forward mast, and the 2-D SPS-40B on the aft mast. (Naval History and Heritage Command)

carrier could not be fully realized. Accordingly, *California* was authorized in 1967 and *South Carolina* the following year.

California Class Construction

Ship	Built By	Laid down	Launched	Commissioned	Fate
California (CGN 36)	Newport News Shipbuilding and Dru Dock Corp., Newport News VA	January 1970	September 22, 1971	February 16, 1974	Decommissioned 1999; scrapped Bremerton 2000
South Carolina (CGN 37)	Newport News	December 1, 1970	July 1, 1972	January 25, 1975	Decommissioned 1999; scrapped Bremerton 2007

Armament

For such large ships, these cruisers were roundly criticized for seemingly being under armed. For the first time on a missile frigate, these ships were fitted with the Mk 13 missile launcher. This was a single-armed launcher usually fitted on destroyers. The Mk 13 could fire the Standard SM-1ER or the SM-2MR missile; two Mk 13s were fitted, one forward and aft. Below each launcher was a magazine that could hold 40 missiles. It could not fire ASROC, so the ships were fitted with a separate ASROC launcher in front of the bridge structure. Other ASW equipment included the SQS-26 sonar and four 12.75-inch torpedo tubes for lightweight ASW torpedoes. The new lightweight Mk 45 5-inch/54 gun mounts were also shipped forward and aft. Two quad packs of Harpoons were fitted amidships. In a step back, no helicopter hangar was included, but there was a helicopter deck on the fantail.

The California class was fitted with an extensive sensor suite. A large planar SPS-48A 3-D radar was fitted on the foremast; an SPS-40 air-search radar was placed on the after mast. Each Mk 13 launcher was supported by two SPG-51D tracker/illuminators. Each SPG-51 provided target illumination for one semi-active homing SM-1/2 missile. Since the SPG-60 radar, mainly intended for fire control of the 5-inch guns, could also perform missile guidance, a total of five targets could be engaged simultaneously.

Both ships received two Mk 15 Phalanx mounts in the 1980s. In 1990, the ships were extensively modernized. A more powerful set of reactors was fitted and the ships received the NTU package. The SPS-49 replaced the SPS-40 and the latest version of the SPS-48 was installed.

Operational Service

California was initially assigned to the Atlantic Fleet. The ship provided an example of the flexibility of nuclear-powered surface ships when she was ordered to react to the hostage crisis in Iran in January 1980. The cruiser escorted *Nimitz* out of the Mediterranean Sea at flank speed and steamed around the coast of Africa and into the Arabian Sea off the coast of Iran. The next year, she circumnavigated the globe, becoming the first nuclear-powered ship to do so since 1964. *California* entered the yards in 1990 for three years for refueling and to receive the NTU upgrade. The timing of their refueling allowed the California class to outlive the newer Virginia class, which was taken out of service first after the USN declined to fund their refueling. *South Carolina* conducted 12 deployments during her career, spending most of her operational time in the Mediterranean, including support to Operation *Desert Storm* in 1991 and Operation *Joint Endeavor* against Yugoslavia in 1995.

California returning to Norfolk Naval Base on May 26, 1980, following an extended deployment to the Mediterranean and the Indian Ocean. Astern the cruiser is *Nimitz*. (Naval History and Heritage Command)

Both ships were retired early. The Mk 13 launcher could not fire the SM-2ER missile and nuclear ships had a higher cost of operations than conventional ships and required higher-trained crewmen to operate them.

California Class Specifications	
Displacement	10,530 tons full load
Dimensions	Length 596ft, beam 61ft, draft 31ft 6in
Machinery	2 reactors driving 2 shafts making 60,000shp
Performance	30kts plus
Crew	603

Virginia Class

These were the last of the missile frigates, though by the time they were commissioned they were classified as missile cruisers. They were also the last of the nuclear-powered surface combatants. By any measure, they were graceful and powerful ships. By the end of their careers, they had received provisions for carrying long-range land-attack cruise missiles, which allowed them to conduct precision attacks on land targets.

The Virginia class was designed as an improved California class. Despite this, their service lives were cut short with the last ship in the class serving under eight years. Upon the end of the Cold War, military funding dropped dramatically and the USN had to make cuts. The Virginia class was still relatively young at the end of the Cold War and its ships were coming up to their mid-life overhauls,

Texas on sea trials in the Chesapeake Bay on July 6, 1977. (Naval History and Heritage Command)

which included nuclear refueling and installation of the NTU package. The cost of this was as high as $300 million per ship – half the price of a new ship. Added to this were the higher operating costs for nuclear cruisers compared to conventionally powered cruisers. From a capabilities standpoint, the Virginia class was lacking, since it could not fire the Standard SM-2ER missile and lacked a helicopter capability. The decision to retire the entire class early was therefore easy and was done between 1993 and 1998.

Virginia Class Construction

Ship	Built By	Laid down	Launched	Commissioned	Fate
Virginia (CGN 38)	Newport News Shipbuilding and Dry Dock Corp., Newport News VA	August 19, 1972	December 14, 1974	September 11, 1976	Decommissioned 1994; scrapped Bremerton 2002
Texas (CGN 39)	Newport News	August 18, 1973	August 9, 1975	September 10, 1977	Decommissioned 1993; scrapped Bremerton 2001
Mississippi (CGN 40)	Newport News	February 22, 1975	July 31, 1976	August 5, 1978	Decommissioned 1997; scrapped Bremerton 2004
Arkansas (CGN 41)	Newport News	January 17, 1977	October 21, 1978	October 10, 1980	Decommissioned 1998; scrapped Bremerton 1999

Armament

The Virginia class was the first to carry the Mk 26 missile launcher. The forward Mk 26 was a Mod 0 variant, which could accommodate only 24 missiles and was primarily intended for ASROC. The Mk 26 Mod 1 system aft could accommodate 44 missiles. That is where the two SPG-51D missile tracking radars were located. Only the SPG-60 tracking radar was forward, which was shared with the 5-inch/54 lightweight guns. The Mk 26 was a rapid-fire system that had a shorter reaction time compared to the Mk 10 launcher, which was also a twin-armed launcher. The Mk 26 could handle the SM-1 and the SM-2MR, but it could not fire the SM-2ER. The cruisers were also fitted with a Mk 45 5-inch/54 single mounts forward and aft. To rectify a major weakness of the California class, the Virginia class was fitted with a helicopter hangar in the fantail. However, this was not a success because the door/elevator leaked badly. When the Tomahawk ABLs were added, the hangar was lost. Each ship was equipped with four fixed torpedo tubes, which could fire the Mk 46 ASW torpedo.

In the 1980s when each ship of the class went into overhaul, they received important upgrades. These included the ability to fire the SM-2, the addition

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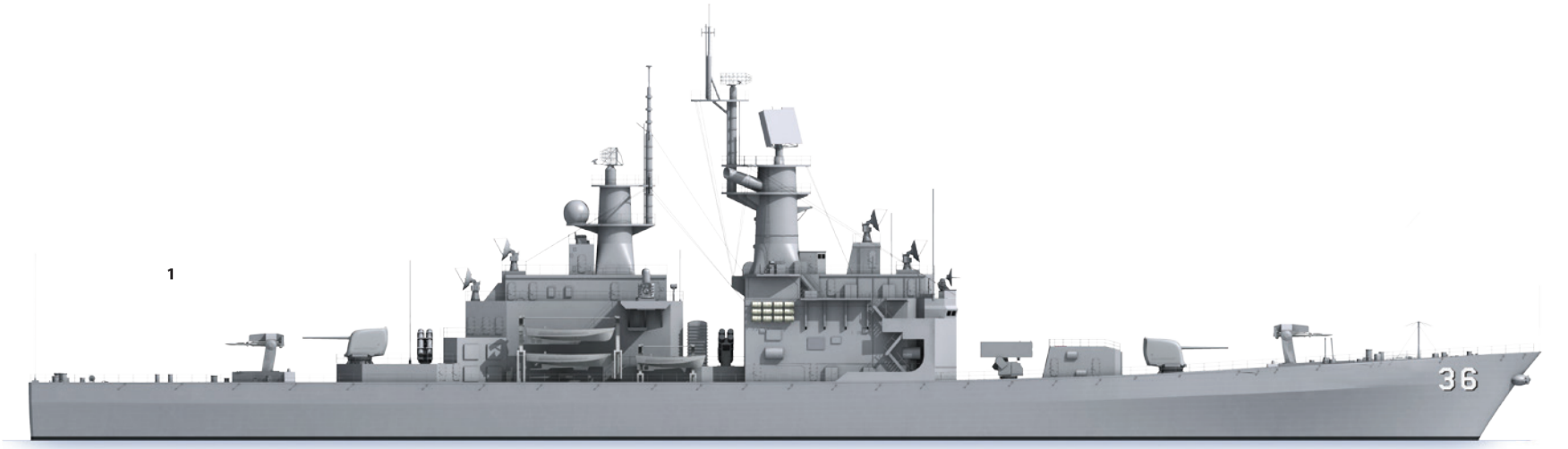
THE NUCLEAR CRUISERS

1. This is *California* after all modifications. The ship appears under-armed, but in fact can engage surface, air, and subsurface targets. Note the Mk 13 missile launchers and Mk 45 5-inch/54 guns paired forward and aft. The extensive electronics suite includes four SPG-55D missile guidance radars, SPS-48 and SPS-49 air search radars, and an SPS-10 surface search radar. Also note the presence of Harpoon launchers and two Mk 15 CIWS mounts.

2. This is *Virginia* in her final configuration. She was the lead ship of the final class of USN missile frigates (later cruisers). *Virginia* projects a powerful and balanced appearance with her two large masts, a pair of Mk 26 missile launchers and a Mk 45 5-inch/54 gun paired forward and aft. Note the placement of two quad Harpoon launchers in front of the bridge and two Mk 15 CIWS mounts amidships. Two Armored Box Launchers can be seen on the fantail, which housed eight Tomahawk missiles.

1



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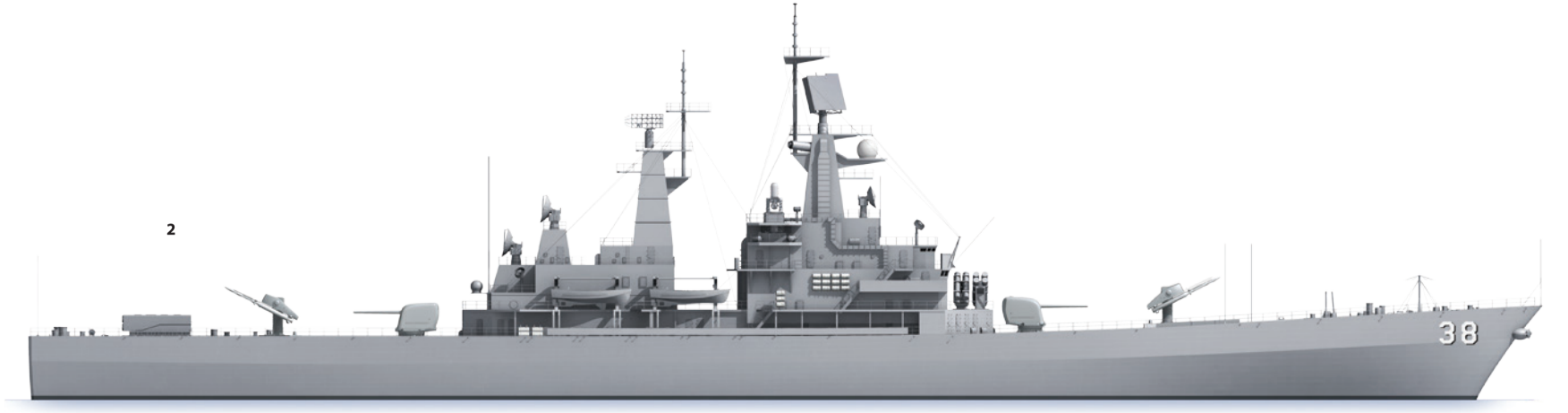

This port broadside view of *Virginia* shows the powerful and balanced appearance of the cruiser. Note the pairs of Mk 26 missile launchers and Mk 45 5-inch/54 guns forward and aft. (Naval History and Heritage Command)

of two Phalanx mounts, two Harpoon quad launchers fitted in front of the forward superstructure, and two ABLs, which could each accommodate four Tomahawk missiles on the fantail.

Operational Service

As the ships were commissioned, they were assigned to the Atlantic Fleet and deployed as escorts for Nimitz-class carriers. During the author's two Mediterranean deployments on *Nimitz* from 1980 to 1983, two nuclear-powered carriers were part of the battle group. *Texas* and *Mississippi* were assigned to the battlegroup in 1981 and the 1982–83 deployment included *Mississippi* and *Arkansas*.

Highlights of *Virginia*'s career included a 1983 shore bombardment of targets near Beirut with 300 5-inch rounds in support of the Marines ashore. She participated in Operation *Desert Storm* from the eastern Mediterranean, from which she fired two Tomahawks against targets in Iraq. *Texas* was part of the *Nimitz* battle group, during which the ship took part in the April 1980 failed hostage rescue operation in Iran and the August 1981 operation against Libya in the Gulf of Sidra, which led to the downing of two Libyan aircraft. *Mississippi* was part of the *Nimitz* battlegroup in 1981, taking part in the freedom of navigation operations against Libya. During Operation *Desert Storm* she fired five Tomahawks from the Red Sea against Iraqi targets in January 1991. *Arkansas* was active for less than eight years and was one of the two ships to transfer to the Pacific Fleet.

Virginia Class Specifications	
Displacement	11,300 tons full load
Dimensions	Length 585ft, beam 63ft, draft 29ft 6in
Machinery	2 reactors driving 2 shafts making 60,000shp
Performance	30kts plus
Crew	520–579

ANALYSIS AND CONCLUSION

USN missile cruisers gave stalwart service throughout the Cold War. The USN was challenged to operate simultaneously in diverse regions and faced different threats in each. As the Navy's most powerful surface ships, missile cruisers proved able to cope with threats as diverse as combat operations off North Vietnam, in the Mediterranean and the Persian Gulf, and countless presence missions all over the world as part of carrier task

forces. Fortunately for all concerned, these ships were never sent into battle against the threat they were designed and built to engage – the Soviet Navy.

The missile cruiser was at the cutting edge of naval technology of the period. For the USN, getting reliable SAMs into service was a multi-year challenge. The Terrier missile system had serious deficiencies when it entered service. First versions had a short range – only 10nm. The vacuum tubes in the missile had to warm-up for 20 seconds before launch, but if the warm-up period was prolonged the electronics could be damaged. The missile guidance radar, the SPQ-5, was unreliable and overly complex. The small warhead of 218 pounds was not lethal enough, so a 1-kiloton nuclear warhead was developed. Talos was in even worse shape and was three years behind schedule in getting to sea. The USN was unhappy with its lack of range and inability to engage low-flying targets.

Exercises revealed continuing problems with the missiles. The missiles were so expensive that actual live fires were infrequent. For example, *Topeka* fired only four missiles from October 1960 to November 1961. Low-flying exercise aircraft were not detected and engaged. Deconfliction with friendly aircraft was a continuing problem. Things were so bad that in 1959, the USN began the Terrier/Tartar Reliability Improvement Program.

Antisurface warfare was a continuing weakness for the USN in the first part of the Cold War, since virtually all the USN's offensive firepower was wrapped up in their aircraft carriers. For the USN's surface force in the 1960s, the emphasis was on ASW. Converted missile cruisers did have antisurface capability by virtue of their significant gun batteries, but these ships were being retired. Some of the missile frigates carried only the 3-inch/50 mount. The USN addressed this problem by placing the 5-inch/54 Mark 42 mount on the Belknap class. This weapon was universally liked but did have reliability issues. SAMs could be employed in an antisurface role, but were limited to line of sight. The Terrier was only shot against surface targets 34 times between 1962 and 1968 and many American naval officers were never trained to use the missile in an antiship role. Only in 1968 after the *Eilat* episode did the USN begin a program to give surface combatants an antiship missile to negate the threat presented by Soviet fast missile boats, large combatants, and missile-firing submarines caught on the surface. The interim solution was to develop an antiship capability for the Standard missile. The real solution was a dedicated antiship missile, but the Harpoon did not enter service until 1977. Even the Harpoon was comparatively short ranged and was out ranged by Soviet antiship missiles.

The USN's missile cruisers (including those originally built as frigates), enjoyed a mixed record of success. The conversion of World War II cruisers was only an interim step. These conversions were important because they got the new SAM technology to sea as soon as possible and because of their service as fleet flagships. The USN's only real missile cruiser, *Long Beach*, was a white elephant, since she was too expensive to be produced beyond a single ship.

Topeka in Malta's Grand Harbor on December 6, 1967 during her first of only two deployments out of the Pacific Fleet. She was the second light cruiser conversion to retain her two forward 6-inch/47 turrets. Because she did not possess flag accommodations, she was active for only nine years as a missile cruiser. In this view, the Terrier-equipped *Topeka* has an SPS-37A on her forward lattice mast, an SPS-30 amidships, and the SPS-52 (an improved SPS-39) on the aft lattice mast. (M. Brescia collection).

This is *Belknap* seen in December 1981 during exercises in the Mediterranean. The ship was recommissioned in May 1980 after repairs from her June 1975 collision and conversion into a fleet flagship. Note the upgraded weapons suite with Harpoon quad launchers in place of the twin 3-inch/50 gun mounts and the addition of Mk 14 CIWS mounts abreast the helicopter hangar. (Author's Collection)

The missile frigates, later cruisers, were more successful, since they were equipped with more mature missile technology and because they were produced in enough numbers to matter. The Leahy class was not a success as originally completed. The ships' lack of a gun was roundly criticized, but their size and hull design made them very seaworthy. The Belknap class were fine ships. They were able to sustain 28 knots in rough seas and enjoyed overall excellent seaworthiness. They were very capable antiair platforms, as all but the first two were completed with NTDS, an improved Terrier missile, the more reliable SPG-55 guidance radars, and the excellent SPS-48 air search radar. To make up for the weakness of the Leahy class, the Belknaps were provided with a Mark 42 gun mount aft. Since they carried ASROC and the powerful SQS-26 sonar, they were also good ASW platforms. They were also improved in the area of habitability. With the NTU package, both the Leahy and Belknap classes became excellent antiair platforms.

In the mid-1960s, funds for building large missile combatants dried up. When construction of large missile combatants resumed, the advocates of nuclear-powered ships in Congress, egged on by the USN's nuclear overlord, Admiral Hyman Rickover, succeeded in getting nuclear frigates funded. The result was some fine ships, but since they cost so much only a relatively small number could be built when numbers were required to counter the growing Soviet threat. With their SPS-48A radars and the ability to control four Tartar/Standard missiles simultaneously, the California class was regarded as the finest antiair platform in the fleet. However, since they had no antiship cruise missiles when completed, they were essentially defensive platforms. The Virginia class was superior in overall warfighting capabilities, but only four were completed.

One of the redeeming features of all USN missile cruisers of the period was their ability to take upgrades. When money was available, all ships received significant modernization, which upgraded their antiair and antisurface capabilities. Those ships receiving the NTU package had their combat systems significantly upgraded, which when combined with the Standard missile made them formidable antiair platforms. The addition of Phalanx provided a reliable and effective inner layer of defense against antiship missiles. The long-awaited addition of the Harpoon missile finally gave these ships a real antisurface capability. *Long Beach* and the Virginia class also received Tomahawk missiles, which made them long-range strike platforms.

Any direct comparison with Soviet missile cruisers of the period would be superficial, since the missions of each navy's cruisers were very different. On a ship-to-ship basis the USN's missile cruisers were generally better ships by virtue of their superior electronics and greater missile magazine capacity. Whether either navy's ships could have accomplished their intended wartime missions would have been dependent on many tactical and operational considerations, which transcended the capabilities of a specific class of ship and would be better answered by a comparison of each navy's overall warfighting capabilities. The USN's missile cruisers were one of the primary systems to defend the carriers throughout the Cold War. With the lack of a reliable antiair missile in the 1960s

and into the 1970s, it would have been doubtful if American missile cruisers could have successfully defended the carriers had the Soviets been successful in firing enough missiles before their missile platforms were destroyed. Even in the 1980s, with USN missile cruisers upgraded with improved missiles and sensors to handle saturation attacks, it remained uncertain whether the missile cruisers could have successfully defended the carriers if the Soviet archers had been able to get off their arrows before they were destroyed.

The arrival of the Aegis system changed everything. But the first Ticonderoga class ships, the first to carry the system, were not authorized until 1977 and did not commission until 1983.

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Dictionary of American Naval Fighting Ships found at the Navy History and Heritage Command website

INDEX

Note: All military hardware is US unless otherwise stated.

ABLs (Armored Box Launchers) 12, 33, 42–44
accidents 30, 32, **46**
Aegis system, the **9**, 10, 47
air defense missiles and cruisers 5, 46–47
antisurface warfare capabilities 45
ASW capabilities 7, **8**, 10, 26, 27, 30, **D(30)31**, **32**, 33, 36, 38, 40, 44, 45, 46

Baltimore class heavy cruisers 6, 7
Burke, Adm Arleigh 7–10
Bush, President George H.W. 32

chaffing 16
classes of guided missile cruisers 4–5, 6
Cleveland class light cruisers 6, 7, 20–21, **C(22)23**
Cold War, the 41, 44–45
Coontz class destroyers 27
costs 7, **9**, 10, 16, 18, 20, 36, 38, 41, 42, 46
cruiser conversion 4, 5–7, **7**, 18, 20–21, **21**, **C(22)**, 25, 45
cruiser designation protocols 6, 20, 38

deployments 13, 20, 21, 24, 26–27, 28, 30, 33–36, 37, 41, **41**, 44
displacement **20**, **22**, **24**, **27**, **32**, **33**, **37**, **38**, **41**, **44**

ECM (electric countermeasures) 12, 16, 18

Gorbachev, Mikhail 32
Gulf War, the 30, 37

helicopters 29, **29**, **32**, 38

London Naval Treaty, the (1930) **6**

McNamara, Robert 9
MiG fighter plane (USSR) 17, 26, 36, **F(38)**
missile cruiser development 5–10, **8–9**
missile frigate escorts **8–9**
missile frigates 5, **6**, **8–9**, 10, 13, 14, 16–17, 27, 28, 36, 37, 38, 40, 41, **G(42)43**, 45–46,
modernization and upgrades **17**, 20, 26, **26**, 28, **28**, **29**, 30, **30**, 33, 36, 37, 38, 41, 44, 46, 47
mounts **9**, **17**, **46**
  3-inch/50 **8**, 18, **B(18)19**, 20, 27, 28, **29**, 30, 36, **37**, 38, 45, **46**
  5-inch/38 7, 26, **26**, **35**, **B(18)19**
  Mk 15 CIWS **29**, **30**, **32**, **37**, **G(42)43**
  Mk 32 torpedo 27, 30, **D(30)31**, **35**, 36
  Mk 42 5-inch/54 12, 28, , **D(30)31**, 42, **G(42)43**, 45
  Mk 45 5-inch/54 12, 40
  Phalanx mount 28, 30, **32**, 33, 37, 38, 40, 44

naval exercises 14, **41**, 45
NTDS (Naval Tactical Data System) **9**, 14, 17, 26, 28, 46
NTU (New Threat Upgrade) 28, 30, 37, 38, 40, 41, 42, 46

Operation *Praying Mantis* (April 1988) **A(14)15**, 17–18
Operation *Sea Orbit* (July–October 1964) 16

PIRAZ (Positive Identification Radar Advisory Zone) duty 17, 26

radar and tracking systems **8**, 10, **10**, 11, **11**, 18,**20**, **28**, 33, 45
  CXRX height-finder **18**, **20**
  SPG-49 **F(38)39**
  SPG-51 40, **40**
  SPG-55 28, 30, **D(30)31**, **36**, 46
  SPS-10 **S(22)23**
  SPS-30 **B(18)19**, **20**, **21**, **24**, 26, **45**
  SPS-37 **B(18)19**, **20**, **21**, **C(22)23**, **24**, **45**
  SPS-48 **B(18)19**, 26, 28, 30, 33, 40, **40**, **G(42)43**, 46
  SPS-49 30, 33, **36**, 37, 40, **G(42)43**
  SQS-26 sonar **8**, 30, 36, 38, 40, 46
ranges **8**, 10, 11, 12, **12**, 13, **13**, 14, **14**, 17, **32**, 41, 45, 46
Rickover, Adm Hyman 46

SAGs (surface action groups) **A(14)15**
SCB 140 design conversion 6
SCB 146 design conversion 6, 7
SCB 173 design conversion 25
Soviet Navy, the 13–14, 16, 45
  Echo II-class nuclear submarine (USSR) 13
  Kresta I class missile boat 13
  Kynda class missile boat 13

technical specifications **20**, **22**, **24**, **27**, **32**, **33**, **37**, **38**, **41**, **44**
technological problems 10–11, 45, 46–47
Terrier/Tartar Reliability Improvement Program, the 45

USN (US Navy), the 4, 14
  missile cruisers
    Albany Class **6**, 7, 10, 11
      USS *Albany* **B(18)19**, 25, 26, **26**
      USS *Chicago* **5**, **7**, 17, 25, 26
      USS *Columbus* 25, 26, **26**, 27
    Belknap Class **6**, **9**, 28–29, **29**, 37, 45, 46, **D(30)31**
      USS *Belknap* **9**, **29**, 30, 32, **32**, **46**
      USS *Biddle* 17, **29**
      USS *Fox* **29**, **32**
      USS *Josephus Daniels* **29**
      USS *Jouett* 17, **29**
      USS *Wainwright* 11, **A(14)15**, 18, **29**
      USS *William H. Standley* **14**, **29**
    Boston Class 18–20
      USS *Boston* 6, 17, **17**, **18**, 18–20, **B(18)19**, **20**
      USS *Canberra* 6, 14, 17, **18**, 18–20, **20**
    Galveston Class 20–22, **22**
      USS *Galveston* 6, **6**, **12**, 20, 21, **21** **C(22)23**
      USS *Little Rock* 7, **11**, 20, 21, **21**, **C(22)23**, 24
      USS *Oklahoma City* 7, **7**, 17, 20, 21, **21**, 24
    Leahy Class **6**, **8**, 14, **27**, **D(30)31**, 36, 46
      USS *Dale* **11**, **27**
      USS *Gridley* **4**, **27**
      USS *Harry E. Yarnell* **27**, **29**
      USS *Leahy* **8**, **27**
      USS *Richmond K. Turner* **27**, **28**
      USS *Worden* **17**, **27**
    Providence Class
      USS *Providence* 7, 22, **22**, 24, **24**
      USS *Springfield* 7, 22, **22**, 24, **24**
      USS *Topeka* 22, **22**, 24, 45, **45**
  nuclear carriers **9**
    USS *Enterprise* 16, **16**, 36, 37
    USS *Nimitz* **9**, 38, 41, 44
  nuclear cruisers 7–10
    California Class **9**, 38–40, 46
      USS *California* 40, 41, **41**, **G(42)43**
      USS *South Carolina* 40, **40**, 41
    USS *Bainbridge* 16, **16**, **D(30)31**, 36–37, **37**
    USS *Long Beach* 5, 10, 11, 12, 16, **16**, 17, 32–36, **E34–35**, **36**, 37, **F(38)39**, 45, 46
    USS *Truxton* 37–38, **38**, **G(42)43**
    Virginia Class 12, 41–44, 46
      USS *Arkansas* **42**, 44
      USS *Mississippi* **42**, 44
      USS *Texas* **41**, **42**, 44
      USS *Virginia* **42**, **G(42)43**, 44, **44**
  USS *Fall River* (cruiser) 25
  USS *Hawaii* 6
  USS *John F. Kennedy* (carrier) 30, 32
  USS *Rochester* (cruiser) 25
  USS *Simpson* (destroyer) **A(14)**

Vietnam War, the 16–17, **17**, 20, 21, 24, 26, 28, 30, 36, 37

weaponry 6–7, **8**, 12, **13**, **26**, 27–28, **29**, 30, **32**, 36–37, 40, **G(42)43**
  AS-2 Kipper missile (USSR) 13
  ASROC (antisubmarine Rocket launcher) 7, **8**, **9**, 25, 26, **26**, 28, 30, **D(30)31**, 33, 36, 37, 40, 42, 46
  BGM-109 Tomahawk Land Attack missile 12
  BGM-109 Tomahawk missile 12, 33, 42–44, 46
  CIWS (Phalanx Close-in Weapons System) 13, 16, **17**, 28, 30, 33, 46
  Mk 26 missile launcher 42, **G(42)43**, **44**
  Mk 42 5-inch/54 gun **D(30)31**, 46
  Mk 45 5-inch/54 gun **10**, 40, **40**, **G(42)43**, **44**
  Mk 46 ASW torpedo 44
  Polaris SLBM (sea-launched ballistic missiles) 26
  Regulus II surface-to-surface missile 26, 33
  RGM-84 Harpoon antiship missile 12, **A(14)**, 18, 28, **29**, 30, 33, 37, **37**, 38, 40, 44, 45, 46, **46**
  SAMs 45
    3-Ts
      Talos long-range missile 4, **5**, 6, 7, 10, 11, **11**, **12**, 14, 16, **B(18)19**, 20, 21, 25–26, 33, **36**, **F(38)39**, 45
      Tartar missile system 7, 10, 11, 14, 26
      Terrier medium-range missile 4, **5**, 6, **8**, **9**, 10, 11, **11**, **12**, 14, **14**, 17, **17**, 20, 22, 27, **29**, 30, 33, 36, **36**, 37, 45
    RIM-66 11, **12**
    Sea Sparrow missile system 16
    Standard missile 18, 20, 45, 46
      SM-1 11, 28, 30, 36, 38, 40, 42
      SM-2 11–12, **A(14)15**, 28, 40, 41, 42, 44,
    Typhon missile system 10, 11
  SS-N-2 Styx antiship missile (USSR) 13, 14
  SS-N-3 Shaddock antiship missile (USSR) 13, 14

Yom Kippur War, the 16

Zumwalt, Adm Elmo 16

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